

GONIADIDAE, GLYCERIDAE and NEPHTYIDAE

Plates 1-19, textfigs 1-3

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This report is based mainly on collections in the Allan Hancock Foundation of the University of Southern California (see also Hartman, 1940, for additional records) and other materials as indicated below. In the GONIADIDAE, *Goniadella* is newly erected, *Ophioglycera* Verrill is revised, two species, *Glycinde polygnatha* and *Goniada littorea* are newly described, and the following are redescribed: *Goniada brunnea*, *G. annulata*, *G. acicula*, *G. teres*, *Ophioglycera gigantea*, *Goniadella gracilis* and *Glycinde solitaria*. New combinations include *Ophioglycera eximia*, *O. foliacea*, *O. longicirrata*, *O. distorta*, *Goniadopsis maskallensis* and *Goniadella gracilis*; *Goniada magna* is referred to an older species.

In the GLYCERIDAE *Hemipodus armatus* is newly described; *Telake* Chamberlin is referred to *Glycera* Savigny; *Glycera canadensis* and *G. epipolasis* are new combinations, and *Glycera spadix* is referred to an older species.

In the NEPHTYIDAE the following species or subspecies are newly described: *Nephtys glabra*, *N. singularis*, *N. assignis*, *N. acrochaeta*, *Aglaophamus erectans*, *A. dicirris* and *A. rubella anops*. *Nephtys monroi* is a new name and the following species are revised: *Nephtys impressa* and *Aglaophamus tabogensis*. The genera *Aglaophamus* Kinberg and *Micronephthys* Friedrich are recognized for additional species. *Nephtys macandrewi* is referred to an older species.

In the GLYCEREA, including the GONIADIDAE and GLYCERIDAE, and in the NEPHTYIDAE, the epithelial structures of the proboscis are detailed and their specific importance demonstrated. New interpretations are given for setal structures.

I am indebted to the administrations of the following Institutions for generous loans to examine holotype and other important materials: to the Peabody Museum of Natural History, Yale University, New Haven for the loan of *Ophioglycera gigantea* Verrill and *Goniadella gracilis* (Verrill); to the American Museum of Natural History, New York for the loan of *Goniada magna* Treadwell, *Goniada teres* Tread-

well, and *Glycera spadix* Treadwell; to the Museum of Comparative Zoology, Cambridge, Massachusetts for the loan of *Goniada quinquelabiata* Augener, *Nephtys bucera* Ehlers and *Nephtys phyllocirra* Ehlers; to the British Museum of Natural History, London, England for the examination of *Nephtys impressa* Baird, *Nephtys monroi*, new name, *Nephtys macandrewi* Baird and *Aglaophamus tabogensis* (Monro); and to the State Museum of Natural History in Stockholm, Sweden for the use of all type specimens erected by Kinberg.

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Superfamily *Glycera* Grube

The superfamily GLYCEREA Grube, 1850, constitutes an assemblage of species that is clearly recognized for 2 families, the GONIADIDAE Malmgren, 1867, and the GLYCERIDAE Malmgren, 1867. Although some authors refer all species to a single family, GLYCERIDAE, the separation into separate families is here considered desirable and logical since there are conspicuous gaps between them, with groups of genera constituting each family.

In the goniadids the anterior parapodia are uniramous, posterior ones are biramous; in the glycerids the parapodia are either only uniramous (*Hemipodus* Quatrefages) or only biramous (*Glycera* Savigny and *Glycerella* Arwidsson). In the first the proboscidal paragnaths or terminal jaws are of 2 kinds, including a pair of larger, dentate macrognaths and many smaller, H- or Y-shaped micrognaths that are arranged in dorsal and ventral arcs and together form a circlet (textfig. 1). In the glycerids the paragnaths consist of 4 widely spaced sets, disposed at ectodorsal and ectoventral ends (pl. 12, fig. 1); each set consists of a falcate jaw with an attached, embedded aileron. In the goniadids the everted proboscis tends to be long and cylindrical in shape; its epithelial surface may be covered with structures that are either uniform (textfig. 1) or greatly diversified (plate 6). In the glycerids the proboscis is usually comparatively short and clavate in shape; its proximal surface is covered with structures that are more nearly uniform or at least not greatly diversified.

On the whole, the body of the goniadids is proportionately much longer and the posterior portion much thicker than the anterior one. In the glycerids the body is usually shorter, approximately fusiform in shape and tapers toward both extremities. It may also be noteworthy that where epitoky is known to occur, in the glycerids it affects the entire individual; in the goniadids the anterior, uniramous portion is not involved.

In members of both families the prostomium is a longer (*Goniada*) or shorter (*Glycerella*) conical or depressed forward extension, transversely marked with few to many rings that resemble annuli but are not true segments since only the surface structures are affected. The forward pointed end has 4 small, biarticulate (the smaller distal article has not always been noted) antennae; the more anterior ones are often inserted at a lower level than the more posterior ones. There may be simple eyes, one pair in the basal ring of the prostomium, and another pair in the distal ring, or one or both pairs may be absent or limited to juvenile stages.

Notopodia, when present, have simple setae that are hairlike, acicular, or capped by a hyaline hood (plate 8). Neuropodia have composite setae (plate 8). In the GLYCERIDAE the parapodial branchiae are sometimes variously developed; they may consist of modified prolongations of parapodial lobes that are retractile or stationary. In the GONIADIDAE no such structures have been described but parts of the parapodial lobes doubtless function for respiration.

The proboscis of the GLYCEREA functions not only for grasping and ingesting food but for locomotion. To this end the structure of the circulatory system is adjusted since it is open; that is, the circulatory fluid is mixed with other coelomic inclusions and propelled freely through the coelomic spaces, including those in the eversible proboscis. The movement of the proboscis has been described in detail for a species of *Glycera* (Støp-Bowitz, 1941, pp. 234-240), where the methods of burying, burrowing and inrolling are detailed, based on laboratory observations. The languettes or long lobes that extend from the distal end of the proboscis into the coelomic space, have also been studied and are thought to function for the disintegration of haemoglobin (Raphael, 1933a).

Epitoky (swarming at maturity) has been described for several species of *Glycera* (Ehlers, 1868, p. 697, Arwidsson, 1899, p. 5, Fage and Legendre, 1927, p. 130) and *Goniada* (Støp-Bowitz, 1941, pp.

226-233). In general it is believed that the goniadial products are formed in great numbers, crowd themselves about the membranes of the proboscis such that the parts of the latter are gradually degenerated and resorbed. The sex cells are then shed through the gaping oral aperture. Accidental puncturing of the surface epithelium of any part of the body, such as might be caused by constant writhing of the body against the substratum, might effect a release of goniadial products (based on personal observations on *Glycera americana* Leidy). At any rate, the life of the individual is terminated with the process.

Planktonic larvae of GLYCEREA have seldom been recorded. Thorson (1946, pp. 75-77) describes early stages of what may be *Glycera alba* Rathke, but states also that though other species of the superfamily are known to occur in the regions that were intensively investigated (northwestern Europe), other species were not definitely observed. Thorson (loc. cit., p. 77) is inclined to the view that the larvae may be non-swimming. The large size of ova of at least some of the species of the superfamily justifies support to this view. Fuchs (1911) has described early stages of a species of *Glycera*.

Family **Goniadidae** Malmgren, 1867

The family GONIADIDAE Malmgren, 1867 (as Goniadea Kinberg, 1866) was first recognized by Kinberg for 4 genera, *Goniada* Audouin and Edwards, *Lacharis* Kinberg, *Epicaste* Kinberg and *Leonnatus* Kinberg (not to be confused with *Leonnates* Kinberg, family Nereidae); *Glycinde* Müller, 1858, was mentioned but not incorporated in Kinberg's scheme. Two groups of species were identified, one with *Goniada* and *Lacharis* for having chevrons or V-shaped pieces on the proboscis, and the other with *Leonnatus* and *Epicaste*, in which such chevrons were thought to be absent. As shown elsewhere (Hartman, 1948b, p. 102) *Leonnatus* has chevrons and thus goes to *Goniada*, and *Epicaste* goes to *Glycinde* (see below). *Eone* Malmgren, 1866, proposed for *E. nordmanni* Malmgren, goes to *Glycinde* (Arwidsson, 1899, p. 50).

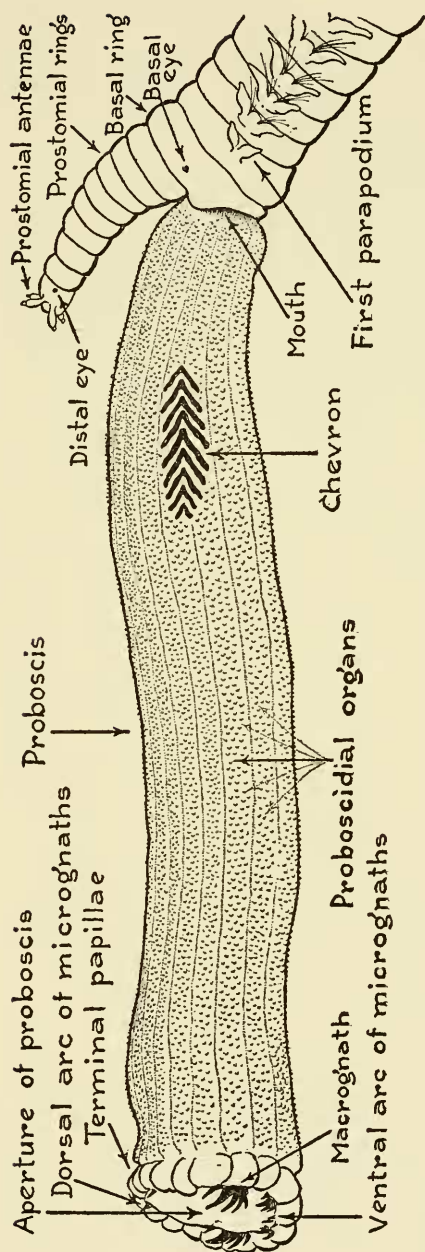
The first 3 species recorded in the family, *Goniada emerita* Audouin and Edwards, 1834, *G. maculata* Oersted, 1843 and *G. norvegica* Oersted, 1845, were European in origin. *Glycinde* Müller, 1858, was erected for *G. multidentis*, from Brazil. Other species have since been ascribed to both these and other genera and species more recently erected.

An important revision of the family was made by Ehlers (1868) who combined them with the GLYCERIDAE to form the superfamily GLYCEREA Grube; he named them GLYCEREA POLYGNATHA (=Goniadidae) and GLYCEREA TETRAGNATHA (=Glyceridae), thus disregarding Kinberg's or Malmgren's separate categories. Ehlers recognized only one genus, *Goniada* in the first group, and referred *Glycinde*, *Epicaste*, *Lacharis*, *Leonnatus* and *Eone* as synonyms of *Goniada*. Arwidsson's (1897 and 1899) studies gave accounts of morphology, anatomy and more extensive geographical data. Other studies of more recent date are McIntosh (1910, pp. 460-471) in which 3 species in 2 genera are described in the fauna for Britain; Fauvel (1923, pp. 381-395) in which 2 species of *Goniada* and one of *Glycinde* are described in the fauna for France, and Støp-Bowitz (1941, pp. 209-228) in which 3 species of *Goniada* and one of *Glycinde* are recorded for Norway.

In the GONIADIDAE the body is long and slender; it consists of 2 or 3 body regions, an anterior one with uniramous parapodia, a broader posterior one with biramous parapodia, or also an intermediate, transitional middle one with 3-4 to 40 or more segments in which parapodia gradually acquire a distinctly biramous condition. This separation into body regions is not to be compared with division into thorax and abdomen in the sedentary polychaetes, since there is no inversion of parapodial parts nor do the internal parts undergo comparable changes.

The prostomium is long, conical or somewhat depressed. Externally it appears annulate (textfig. 1) and these rings may be secondarily divided. The prostomium tapers to its forward part and ends in 4 slender, biarticulate *antennae*. There may be a pair of *eyes* in the basal ring or another pair in the distal one; they resemble simple pigment spots and are usually embedded in the prostomial tissue. In older individuals they may be obscure or even vanished.

The proboscis is long and cylindrical, to shorter and somewhat clavate. It is eversible from the oral aperture or *mouth*, at the postero-ventral side of the prostomium. The proboscis is an extensive, tubular anterior prolongation of the alimentary tract. When completely retracted it is withdrawn to lie entirely within the body, and is folded back upon itself the length of the eversible part. Then it extends back through anterior or also median (when present) body regions. When partially or fully everted it may extend forward a great distance in front of the prostomium (plate 6).



TERMINOLOGY OF STRUCTURES OF THE ANTERIOR END, BASED ON GONIADA BRUNNEA

TEXTFIGURE 1

Terminology of structures of the anterior end, based on *Goniada brunnea* Treadwell.

The gross external structures of the proboscis are most easily identified when fully everted. At its distal end there is a circlet of soft, *terminal papillae* numbering about 17 to 20; they are usually largest on the ventral side and decrease in size middorsally. Within this ring there is a circlet of dark, hard *paragnaths* including a pair of larger, dentate *macrognaths* on the sides or midventrally, and more or less numerous, smaller, H- or Y-shaped dark, hard pieces called *micrognaths*, arranged in dorsal or also ventral arcs, usually disposed in a single, or sometimes partial to complete double row. The proximal surface of the proboscis is more or less uniformly covered with smaller, pale or translucent, soft structures; they are here called *proboscidual organs*. Based on this report, their structure suggests a function concerned with maintaining traction and grip, as well as rapid movement through the substratum.

The terminology concerning these organs is in confusion. They have been variously called papillae, platelets, paragnaths, stout hooks, hook-like papillae, tooth-papillae, proboscidual papillae, cuticular or horny papillae, papillae pharyngis, and other descriptive or functional names. The dark V-shaped, horny structures or *chevrons* near the base of the proboscis have been called V-shaped plates, chevron-shaped jaws, longitudinal rows of angled jaws, maxillae angulatae, dents en chevrons, and other names. The large jaws at the end, or *macrognaths* have been called main jaws, horny jaws, maxillae terminales laterales, and others, and the smaller jaws or *micrognaths* have been known as accessory jaws, small quadricuspidate teeth, X-shaped paragnaths, maxillae terminales transversae, ring of small horny teeth, and other names.

The following chart compares the usage of some of these terms, with references.

COMPARISON OF TERMINOLOGY FOR PARTS OF THE PROBOSCS IN THE GONIADIDAE

<i>Chevrans</i>	<i>Paragnaths</i>		<i>Proboscial organs</i>	<i>Authority</i>
	<i>Macrognaths</i>	<i>Micrognaths</i>		
dents en chevrons	deux machoires cornees	ceinture de petites denticules cornees	---	Audouin and Edwards, 1834
maxillae angulatae	maxillae terminales laterales	maxillae terminales transversae	papillae pharyngis	Kinberg, 1866
winkelhakigen Kieferspitzen	Hauptkiefer	Nebenkiefer	Kieferspitzen Zähnen, Plättchen (for <i>Glycinde</i>), Papillen (for <i>Goniada</i>)	Ehlers, 1868
---	---	---	stout hooks	Webster, 1879
---	large jaws	small jaws	paragnaths	Levinson, 1879
V-formige Chitin-stücken	Kiefer	Kiefer	hakenähnlichen Papillen	Arwidson, 1899
V-shaped teeth	macrognatha	micrognatha	small papillae	Pratt, 1901
chevron-shaped jaws	principal jaws	accessory jaws	cuticular papillae	Moore, 1905
---	jaws	jaws	horny papillae or paragnaths	Moore, 1911
V-formige Chitin-stücken	Hauptkiefer	Nebenkiefer	Papillen; Zahnpapillen	Augener, 1918
---	jaws	jaws	paragnaths	Southern, 1921
chevrans	grosses mâchoires chitineuses pluridentées	nombreaux paragnathes cornes	papillae	Fauvel, 1923
Winkelkiefer-langsreihen	Hauptkiefer	Micrognathen	Rüscelpapillen	Augener, 1927
---	---	---	teeth	Monro, 1928
V-shaped plates	---	---	papillae	Treadwell, 1931
chevrans	horny jaws	X-shaped paragnaths	papillae	Fauvel, 1932
V-formige Chitin-stücken	Hauptkiefer	Kleinkiefer	Rüsseloberflächenpapillen	Augener, 1933
chevron	macrognath	micrognath	papillae	Monro, 1936 and 1937

The proboscicial organs are arranged in groups of 18 longitudinal bands that are separated by shallow furrows. The bands correspond in distribution to the terminal papillae and the 18 longitudinal muscular bands of the proboscis; the furrows follow the directions of 18 large longitudinal nerves (textfig. 3). The organs may be almost uniformly distributed over the proboscicial length, or they may diminish toward the basal or paragnathal ends, or they may be more or less restricted to dorsal or ventral sides of the proboscis. When they consist of heterogeneous pieces, as in *Glycinde* (plate 6) they are arranged in trim series and present a striking pattern that grossly resembles the radula of a gastropod.

During the course of this investigation it has been found, for all species of GLYCEREA investigated, that these organs (except for the chevrons and one lateral, possibly homologous series in *Glycinde*) have a larger terminal or subterminal pore (on the abgnathal side) that leads through a canal to one or a few large cells within the organ. In some species these processes resemble sucking disks (plate 4); in others they may be likened to grapnels (plate 6). In all instances where examined, the organs are specific and more or less uniform throughout the proboscicial length. The pore and central canal of the individual organ have been observed by some investigators, but the 3-dimensional relations have remained obscure or unknown.

Thus, Benham (1932, p. 555) described, for *Goniada maorica* (below) "pharyngeal papillae . . . a minute pore lies nearly halfway down one side . . . The pore leads into an axial canal of much greater diameter," and again, for *Goniada grahami* Benham (1932, p. 561), "papillae with pore and a groove;" also, Monro (1937, pp. 284-285) described for *Goniada eximia* "papillae on the proboscis . . . kidney-shaped with a central canal;" for *Goniada ?longicirrata* "papillae of the proboscis are roughly triangular in outline, and have a passage running up from the exterior (sic) to the central canal;" and for *Goniada multidentata indica* Monro (1937, p. 284) the papilla from the proboscis is "cordiform with a central canal."

Casual microscopic examination of the proboscicial organs leads almost invariably to erroneous interpretations, largely because of imperfect, damaged structures and distorted optical views. Since these organs are minute, 3-dimensional objects, sometimes with striking bisymmetry, arranged on a membrane that is cylindrical, they are seldom seen in identical views on slide preparations. Unless they are removed from the proboscicial tissue with care, they are distinguished

with difficulty because of the opaqueness of underlying tissues. Also, unless they are removed with the enclosed connective tissue, which is in intimate contact with the tissues below, they are apt to be collapsed or broken. Even in fixed or killed material the inner, soft, membranous portion is often shrunken or collapsed so that the outer sheath is distorted. Organs that are heavily chitinized and have articulating bases (see *Glycinde*) do not present the same difficulties. The beautiful, ornamental symmetry of some of these structures can be seen by comparison of figures on the accompanying plates.

The chevrons (pl. 2, fig. 2) which sometimes accompany the proboscoidal organs, consist of series of V-shaped, flat pieces. It is possible that they function for stabilization of the long body or also to maintain traction during progression. Chevrons are lacking in species of *Glycinde*, but the series numbered IV (textfig. 2) may be the homologous parts, since they too lack a terminal pore.

The number of teeth in macrognaths and the number of pieces comprising dorsal and ventral arcs of micrognaths has sometimes been used for specific diagnosis, but it may be doubted if their numbers are as constant as one might wish. Both kinds of paragnaths are probably subject to breakage, loss and repair, and there is apt to be additional variation depending on age or other individual features. More complete details are given in specific accounts.

The first parapodia are on the first body ring or peristomium. They are small but gradually come to be larger and lateral in position. In anterior segments through a limited region, they are uniramous and consist of a neuropodium with dorsal and ventral cirri. Presetal and postsetal lobes are developed and sometimes have specific significance. Setal structures in notopodia and neuropodia usually consist of single acicula and fanshaped fascicles of composite, spinigerous, or also falcigerous setae. When transitional segments are present, both notopodia and neuropodia increase in size gradually; this middle region may be very short (a few segments) or long (70 or more segments). Neuropodia in the posterior region resemble those in front but they increase in size. Notopodia, where present, are much smaller than neuropodia; they have single acicula and few to many simple setae that may be coarse and acicular, or slender to hairlike.

Presetal lobes of neuropodia are sometimes very characteristic; in species of *Goniada* they are usually bifurcated; in those of *Glycinde* the presetal lobe is single but in at least 2 species, *G. dorsalis* Ehlers and *G. armata* (Kinberg), there is a partial bifurcation of this lobe in posterior

segments. In some species it may be strongly obcordate (*G. armigera* Moore); in others it may be merely long and triangular (*G. wireni* Arwidsson). The notopodial cirrus (=dorsal cirrus of some authors) is usually simple and conical or flattened and foliaceous but sometimes has a sub-distal incision (pl. 7, fig. 15).

Setae are not greatly diversified. Notosetae are simple and lack articulation. When slender to hairlike they are usually numerous in a fascicle; when thick and acicular they tend to be few in number and more or less deeply embedded, resembling acicula. The tip may be straight or weakly recurved and provided with a conical hood (*Glycinder*). Notosetae are usually pale in color, rarely dusky. Neurosetae are composite and have a distinct articulation. The appendage is usually spinigerous but in species of at least 2 genera it is also falcigerous (pl. 5, fig. 5). The shaft is a cylindrical stalk, widening distally into a ladlelike concavity to accommodate the base of the appendage. It is longest in front (this refers to an arbitrary orientation, indicating the cutting edge of the appendage) and shortest in back (marking the side directly opposite the front). Between the front and back, the sides slope gradually. The mechanical structures of the shaft and appendage are such that they tend to twist the articulation; thus the 2 parts are not to be seen in the same orientation at any one time.

The distal end of the shaft is usually broad in front and sometimes strikingly serrated (pl. 12, fig. 12); it is smoothly excavate or slightly roughened in back. Consequently the shaft tends to lie with either front or back upward. The appendage, however, is knifelike and so constructed that it tends to lie with serrated edge on one side, or blade side up. As a result, the articulation is usually seen, not in lateral, but in three-fourths view. Functionally, the movement of the appendage in the shaft is a rotary-backward one, but the normal position is for these 2 parts to lie in a straight line. Illustrations in plates 2 and 6 show normal positions; those in plates 3 and 4 show the articulation in three-fourths view, or as they are generally seen in slide preparations. These facts are clearly demonstrable when the shaft and appendage are severed from each other. The 2 parts are attached to one another by longitudinal fibers that extend through the concavity of the shaft. Sometimes the distal end of the shaft is worn; its edges may then be unnaturally divided.

The GLYCEREA have sometimes been regarded as predaceous and carnivorous (Ehlers, 1868, McIntosh, 1910, and others). Stolte (1932, pp. 425-429) however, regards the group as detritus feeding; all food

is taken in by everting the proboscis and the indigestible material is thrown off from the mouth. The large jaws are used to grasp particles. Stolte (loc. cit.) was not able to explain the use of the large glands that are attached to the base of the proboscis; Ehlers (1868, p. 643) presumed them to be poison secreting, but this statement requires substantiation.

Details of development are unknown for species of GONIADIDAE. Most are subintertidal and thus not readily subject to experimental treatment. In so far as known the sexes are separate. Epitoky has been occasionally recorded but the details have not been described. In *Ophioglycera* (below) it may involve median and posterior segments, but epitokous setae have not been noted. Among individuals of *Glycinde armigera* Moore (below) there are some in which median and posterior segments have greatly prolonged composite (not simple) setae, recalling those of epitokous individuals in some other genera. Increase in length of these setae has affected only those in the middle of fascicles, where both shaft and appendage are prolonged. In some specimens the body cavity and parapodial bases of these segments are closely crowded with ova, indicating approach or attainment of maturity. In some species of *Goniada* the posterior parapodia may acquire some long simple setae (Støp-Bowitz, 1941, p. 226).

The GONIADIDAE are here recognized through 5 genera; they are *Goniada* Audouin and Edwards, *Glycinde* Müller, *Ophioglycera* Verrill, *Goniadopsis* Fauvel and *Goniadella*, new genus. Each is discussed below.

KEY TO GENERA OF GONIADIDAE

1. Proboscis with organs of many kinds (pl. 6) . . . *Glycinde*, p. 44
1. Proboscis with organs of one or few kinds 2
2. Proboscis with chevrons (pl. 3, fig. 5) 3
2. Proboscis without chevrons 4
3. Neuropodia with only spinigerous setae *Goniada*, p. 13
3. Neuropodia with falcigerous (pl. 5, fig. 5) and spinigerous setae *Goniadella*, p. 41
4. Neuropodia with only spinigerous setae . . . *Ophioglycera*, p. 35
4. Neuropodia with falcigerous and spinigerous setae *Goniadopsis*, p. 41

Genus *Goniada* Audouin and Edwards, 1834Type *G. emerita* Audouin and EdwardsIncludes *Leonnatus* Kinberg, 1866

The body is more or less sharply divided into 2 or 3 regions, an anterior one with uniramous parapodia, a posterior one with biramous ones, or also a transitional one with subbiramous podia. The prostomium is long and conical or depressed (pl. 1, fig. 1). It consists of annulations or rings and ends in front in 4 slender, biarticulate antennae. The proboscis is long and cylindrical or slightly clavate, when everted. Paragnaths include a pair of large, dentate macrognaths separated from each other by dorsal and ventral arcs of micrognaths (textfig. 1) or one or both of these arcs may be absent. The proximal part of the proboscis has, on either side, a series of dark, hard V-shaped pieces or chevrons. Most of the proximal surface is covered with minute, fleshy or sometimes corneous, yellow or colorless, proboscicial organs that are irregularly distributed or in longitudinal bands.

Notopodia have single acicula and setae that are acicular to rod-like or slender and hairlike. Neuropodia have single acicula and composite setae with spinigerous appendage. The presetal neuropodial lobe is usually deeply bifurcated (pl. 1, fig. 2).

The numerous species of *Goniada* are approximately divisible into 2 groups, based on the relative thickness and number of notosetae. In some species the notosetae are slender, distally pointed or hairlike; in others they are thicker, fewer and acicular. Although this separation is artificial, it is useful in effecting an approximate grouping.

The species that may be regarded as having hairlike notosetae are:

G. annulata Moore, see p. 20.

G. brunnea Treadwell, see p. 17.

G. congoensis Grube, see p. 28.

G. congoensis hupferi Arwidsson, see p. 28.

G. eximia Monro, 1937, see p. 31.

G. falklandica Pratt, see p. 30.

G. littorea, new species, see p. 23.

G. maculata Oersted, see p. 20.

G. maorica Benham, see p. 29.

G. norvegica Oersted, see Fauvel, 1923, p. 393, fig. 155.

G. pallida Arwidsson, 1899, p. 43, from western Sweden.

G. quinquelabiata Augener, see p. 26.

G. uncinigera Ehlers, see p. 25.

- G. virgini* Kinberg, 1866, p. 247; 1910, pl. 21, fig. 9, from southern South America. The type specimen was examined and found lacking the significant parts of the proboscis but chevrons are few; the species continues poorly known.
- G. vorax* (Kinberg). See Hartman, 1948b, p. 102.
- In a second group of species the notosetae are acicular or rodlike:
- G. acicula* Hartman, see p. 31.
- G. antipoda* Augener, 1927a, p. 202, from Australia.
- G. australensis* Quatrefages, 1866, from Port Jackson, Australia. See Augener, 1927a, pp. 197-202, fig. 9, for redescription.
- G. emcrita* Audouin and Edwards, see p. 32.
- G. galaica* Rioja, 1923, from southwestern Europe. See Fauvel, 1927a, p. 411, for description.
- G. grahami* Benham, see p. 34.
- G. japonica* Izuka, see p. 35.
- G. multidentata* Arwidsson, 1899, p. 45, from Congo, west Africa.
- G. multidentata indica* Monro, 1937, p. 284, from the Gulf of Aden. Wesenberg-Lund, 1949, p. 297, has described it from Iran.
- G. teres* Treadwell, see p. 33.
- G. tripartita* Monro, 1931, p. 19, from the Great Barrier Reef, Australia.
- Other species for which the character of notosetae is not known are:
- G. alcockiana* Carrington, 1865, p. 182, from England. McIntosh, 1910, p. 466, regards it as a possible variety of *G. maculata* Oersted.
- G. bobrezkii* Annenkova, 1929, p. 495, from the Black Sea.
- G. echinulata* Grube, 1870, p. 67, from Brazil.
- G. euxina* Jakubova, 1930, p. 872, from the Bay of Sevastopol.
- G. felicissima* Kinberg, 1866, p. 247, off St. Helena Island.
- G. oculata* Treadwell, 1901, p. 201, from Puerto Rico. This is questionably a member of the genus since the neuropodial lobes are undivided, as in *Glycinde*; since the proboscis was not described the species cannot be properly allocated.
- G. oculata* Augener, 1933b, p. 312, from Goajira, Colombia. Homonym. This is a true *Goniada* since the proboscis has chevrons; presetal lobes of neuropodia are bifurcated; it is not the same as *G. oculata* Treadwell, 1901.
- G. paucidens* Grube, 1878b, p. 185, from the Philippines.

A synoptic review of the genus *Goniada* is given by Pratt (1901a, pp. 3-11) in partial support for a bipolar theory of the distribution of marine organisms (Pratt, 1901b, pp. 14-15). The list of tropical species as given (loc. cit., p. 6) includes 4 names (*G. felicissima*, *G. virgini*, *G. pausidens* (sic), and *G. echinulata*) that remain doubtful or incompletely known; another species (*G. longicirrata*) goes to *Ophioglycera*, and 2 others (*G. congoensis* and *G. hupferi*) may be regarded subspecific. In addition, the foundation for the theory is weakened by the fact that *G. norvegica* var. *falklandica* Pratt (loc. cit., pp. 3-6) from the Falkland Islands has its nearest affinities, not with the northern *G. norvegica* Oersted, but with a form that occurs also off southern South America (see below).

The checkered distribution of species of *Goniada* is noteworthy. Some species are known from all major oceans but the majority are from areas that have been most intensively investigated.

Seven species are recorded from various parts of Europe: *G. emerita* Audouin and Edwards; *G. maculata* Oersted, *G. norvegica* Oersted, *G. galaica* Rioja, *G. pallida* Arwidsson, *G. felicissima* Kinberg and *G. bobrezkii* Annenkova (from the Black Sea).

Five species are recorded from the West Indies and Brazil: *G. echinulata* Grube, *G. congoensis* quinquelabiata Augener, *G. teres* Treadwell, *G. virgini* Kinberg and *G. vorax* Kinberg.

Five species are known from various parts of Australia: *G. antipoda* Augener, *G. australensis* Quatrefages, *G. grahami* Benham, *G. maorica* Benham and *G. tripartita* Monro.

Three species come from the northeast Pacific: *G. annulata* Moore, *G. brunnea* Treadwell and *G. littorea*, new species.

Three species or subspecies are west African: *G. congoensis* Grube and subspecies *hupferi* Arwidsson, and *G. multidentata* Arwidsson.

Two species are recorded from Japan: *G. japonica* Izuka and *G. maculata* Oersted. Two also come from the Persian Gulf or vicinity: *G. multidentata indica* Monro and *G. maculata* Oersted.

Single species are known from the Strait of Magellan, with *G. uncinigera* Ehlers (or also *G. falklandica*, see below), from the Philippine Islands, with *G. paucidens* Grube, from the Red Sea, with *G. emerita* Audouin and Edwards, and from the Sea of Sevastopol, with *G. euxina* Jakubova.

KEY TO SPECIES OF *Goniada*

1. Notopodia with slender hairlike setae 2
1. Notopodia with acicular or rodlike setae 11
2. Posterior and median neuropodia with 2 presetal lobes (pl. 1,

fig. 2)	4
2. Posterior and median neuropodia with single, longer presetal lobe (pl. 3, fig. 3)	3
3. Notopodia with a prolonged presetal lobe (pl. 3, fig. 3)	23
. <i>G. littorea</i> , p.	
3. Notopodia without a prolonged presetal lobe. <i>G. uncinigera</i> , p.	25
4. Proboscis with a midventral longitudinal series of bifurcated organs	28
. <i>G. congoensis</i> and subspecies, p.	
4. Proboscis without such midventral modified organs	5
5. Dorsal arc of micrognaths on proboscis well developed, with 14 to 18 or more in a row	7
5. Dorsal arc of micrognaths much reduced (textfig. 1) or absent	6
6. Proboscidial organs broadly flaring (pl. 1, figs. 5, 6)	17
. <i>G. brunnea</i> , p.	
6. Proboscidial organs much less flaring (pl. 1, figs. 7, 8)	20
. <i>G. maculata</i> , p.	
7. Prostomium with 5 or fewer annuli (pl. 2, fig. 1)	20
. <i>G. annulata</i> , p.	
7. Proboscis with 8 or more annuli	8
8. Parapodial change from uniramous to biramous condition at about segments 33-37; micrognaths number about 20 to 24 in the dorsal and 20-24 in the ventral arc	26
. <i>G. quinquelabiata</i> , p.	
8. Parapodial change after segment 50	9
9. Chevrons number 4 pairs; parapodial change at about segment 55	30
. <i>G. falklandica</i> , p.	
9. Chevrons more numerous	10
10. Parapodial change after segment 55-60	14
. <i>G. vorax</i> , p.	
10. Parapodial change transitional between segments 70-112; micrognaths number 23 in dorsal and about 16 in a ventral arc	29
. <i>G. maorica</i> , p.	
11. Chevrons very numerous	12
11. Chevrons not conspicuously abundant	13
12. Chevrons number about 90 pairs and extend along most of the proboscidial length; macrognaths with 12 teeth; anterior end with 36 uniramous segments; micrognaths with 30 dorsal and 12 ventral pieces	14
. <i>G. multidentata</i> , p.	
12. Chevrons number about 45 pairs; macrognaths with 6 teeth; micrognaths total about 26 pieces; parapodial segments 36 to 43 are transitional	14
. <i>G. multidentata indica</i> , p.	

13. Body divided into 3 regions, an anterior uniramous one of about 63 segments, a median one with 28-30 segments and a long posterior one; notosetae distally curved *G. acicula*, p. 31
13. Body with only 2 regions or with a short transitional region; notosetae distally straight or nearly so 14
14. Postsetal lobe of biramous parapodia prolonged in its inferior part; prostomium with 10 annuli; chevrons number 12 or 13 pairs *G. australensis*, p. 14
14. Postsetal lobe of biramous parapodia prolonged at the middle 15
15. Prostomium with 7 annuli; chevrons number 24 pairs; anterior uniramous region with 88-90 segments . . . *G. grahami*, p. 34
15. Prostomium with 8 annuli; chevrons number 7-12 pairs; anterior region with about 57 segments . . . *G. emerita*, p. 32
15. Prostomium with 9 annuli; chevrons number 19 pairs; anterior region with about 76 segments . . . *G. japonica*, p. 35
15. Prostomium with 10 annuli; chevrons number 10 pairs; anterior region with about 49 segments with 8 or 9 transitional . . . *G. teres*, p. 33

Goniada brunnea Treadwell, revised

Plate 1, figs. 1-6, plate 4, fig. 1, textfig. 1

Treadwell, 1906, p. 1174, figs. 67-70; Treadwell, 1914, p. 198 (in part); Moore, 1911, pp. 306-307; Berkeley, 1927, p. 412.

G. annulata Treadwell, 1914, p. 198 (in part).

G. maculata Hartman, 1940, pp. 251-252; Berkeley, 1941, p. 34. (*not* Oersted).

Berkeley, 1942, p. 194; Hartman, 1944c, p. 254.

Collections.- 887-38 (2)¹; 889-38 (2); 990-39 (1); 996-39 (2); 1030-40 (5); 1126-40 (2); 1130-40 (6); 1132-40 (1); 1134-40 (1); 1137-40 (1); 1142-40 (1); 1160-40 (1); 1192-40 (1); 1200-40 (1); 1205-40 (6); 1211-40 (1); 1232-41 (2); 1235-41 (2); 1245-41 (1); 1267-41 (1); 1274-41 (2); 1275-41 (5); 1289-41 (1); 1311-41 (1); 1312-41 (1); 1313-41 (1); 1316-41 (1); 1321-41 (2); 1373-41 (2); 1379-41 (2); 1387-41 (6); 1390-41 (3); 1411-41 (1); 1412-41 (1); 1436-41 (2); 1471-42 (1); Tomales Bay, California, shore (1); dredged off Balboa, California (1); off Redondo Beach, California in

¹ For data concerning station numbers, see Fraser, 1943.

25-125 fms, collected by T. Burch (1); off La Jolla, California in 45 fms (1); dredged off southern California, reported as *G. annulata*, see synonymy above (3).

This is large, robust and dark (preserved), maculate over parapodial lobes, cirri and at the sides of the body. Larger, presumably older individuals are usually darker than smaller ones. The largest are over 7 inches long (preserved) but most are only half as long or less, with one (station 1387-41) only about 15 mm long. The parapodial change is abrupt and occurs at segment 44 or 45.

The prostomium is broader than that in most species of the genus; it is depressed, truncate, clearly annulate with 8 to 10 rings. It terminates in front in a broad, slightly spatulate end with 2 pairs of bi-articulate antennae inserted at the anterolateral margins. A pair of basal, deeply embedded eyes can usually be distinguished, or also distal eyes (textfig. 1) or eyes are absent (pl. 1, fig. 1) in some individuals.

The fully everted proboscis is comparatively short but cylindrical (textfig. 1); it is only about as long as the first 23 segments (preserved). Under low magnification it appears smooth on its proximal surface but when enlarged it is seen to be closely covered with tiny, low proboscidial organs that are appressed to the surface; they resemble low, flat scales (pl. 1, fig. 4). The terminal papillae are low, small, widely spaced and number 17 or 18; the ventralmost are the largest. The chevrons are variable in number; they may consist of as many as 18 or more on a side but are usually fewer and rarely vestigial. A larger individual from station 1130-40 has 17 on a side, but a smaller one from station 1132-40 has only 7 on a side. The smallest individual, 15 mm long, from station 1387-41 lacks chevrons on the left side and has only 2 pieces on the right one. The other parts of the body, however, are in agreement with larger specimens.

Macroganths are dark and have 3, 4 or 5 teeth, the largest at the superior end. In cases where there are only 3 teeth, one can usually distinguish 2 or 3 minute ones at the ventral end. Microganths vary in number, depending probably on size or age of the individual. In smaller specimens the ventral arc may have only 3 larger pieces, but this number varies through 5, 7 (pl. 4, fig. 1), 9 or even 12 pieces in the largest individuals. The dorsal arc in smaller individuals may consist of 4 widely spaced, inconspicuous, Y-shaped pieces, but larger specimens may lack them altogether or the pieces may be embedded so as to escape notice unless they are dissected out. One specimen from station 1134-40 has 9 pieces in the ventral arc and 4 minute ones in

the dorsal one; another from station 1472-40 has 9 below and none above; a large specimen may have 12 below and none above, and 19 pieces in each chevron. This indicated variation justifies the view that the number of micrognaths and pieces in the chevron has little specific significance in the species, *G. brunnea*. The same degree of inconstancy has not been reported in other species, to my knowledge.

Parapodia are characteristic, especially in posterior segments. The dorsal cirrus is large, broad and foliaceous, and has a slender base (figs. 2, 3). The notopodium consists of a long, triangular, prestal lobe that nearly equals the dorsal cirrus in length, and a much shorter, lower postsetal lobe. Notoetae consist of thick, pointed setae with 11 or 12 in a fascicle. Acicula occur singly and are translucent yellow; they do not project from the parapodium.

Neuropodia are longer and heavier than notopodia. They consist of 2 long, triangular, presetal lobes that resemble the ventral cirrus but are flatter. The superior part tends to be longer than the inferior one or the 2 may be subequal. Neuroetae are entirely composite spinigerous; they number about 22 in a fascicle. They are slenderer than the notoetae. Anal processes are 2 long, slender filaments.

G. brunnea resembles *G. maculata* (see below) and was earlier (Hartman, 1940, p. 251) thought to be the same. Both species are maculate, have similar parapodial parts and comparable proboscis organs. Both have a broad, depressed prostomium. In *G. brunnea*, however, the dorsal cirri are broader than in *G. maculata* and the notopodium has a short, postsetal lobe that is absent from *G. maculata*. *G. brunnea* approaches *G. eximia* Ehlers in its gross features but the latter is here referred to *Ophioglycera* Verrill (below).

The numerous individuals listed above are referred to this species as interpreted by Moore (1911) and not as in the original (Treadwell, 1906) account. The latter is wanting in many respects and the proboscis remains altogether unknown.

Three specimens reported as *G. annulata* (Treadwell, 1914, p. 198) dredged off southern California, have been examined and are here referred to *G. brunnea*; these specimens are now deposited in the Allan Hancock Foundation.

Distribution.—This occurs commonly in the Eastern Pacific Ocean from Alaska south to southern California and possibly in Hawaii; depths range from low intertidal to over 600 fms.

Goniada maculata Oersted

Plate 1, figs. 7, 8

Verrill, 1881, p. 289; Webster and Benedict, 1887, p. 726; Fauvel, 1923, pp. 392-393, fig. 154; Okuda, 1939, pp. 233-234, fig. 8; Berkeley, 1942, p. 194; Hartman, 1948a, p. 7; Wesenberg-Lund, 1949, pp. 296-297.

Not Hartman, 1940, p. 251, or Berkeley, 1941, p. 34.

Collections.—Gullmar Fjord, Sweden, dredged (1); off Cape Cod, Massachusetts, dredged in 1879 (1); Massachusetts Bay, dredged in 1878 (5).

The parapodial change from anterior to posterior regions occurs at about segment 39-41. Chevrons of the proboscis number 7 to 11 pieces on a side. Micrognaths number about 4 larger pieces in the ventral arc and 2 or 3 smaller pieces in the dorsal arc.

The proboscidian organs (figs. 7, 8) are of a single kind but vary somewhat in size. They resemble those of *G. brunnea* (pl. 1, figs. 5, 6) but the surrounding flange is less flaring and the organs are attached differently so that they usually appear cordate instead of subcircular, when seen from the front. Furthermore, although the flange is crescentic, it is usually directed downward so that the base of attachment is seen from the front. As in *G. brunnea*, the pore of the central mass is directed away from the gnathal end. The pore leads to a canal and large cell, and on its outer side to a depressed groove that has no connection with the inner canal.

Distribution.—*G. maculata* is the most widely distributed of all known species of the genus; it is recorded from western Europe, north-eastern North America, Alaska and northern Japan (Okuda, 1939); Wesenburg-Lund (1949) has recorded it from the Gulf of Iran.

Goniada annulata Moore, revised

Plate 2, figs. 1-9

Moore, 1905, pp. 549-553, figs. 45-48; Moore, 1911, pp. 395-396; Berkeley, 1945, pp. 330-331; Hartman, 1948a, p. 7.

Not Treadwell, 1914, p. 198, or Fauvel, 1932a, pp. 121-122, pl. 3, figs. 9-16.

Collections.—Yes Bay, Alaska, to Anan River and return, U.S.S. *Albatross* station D. 4748, Aug. 29, 1905, in 185-300 fms, mud and shale (1).

The single individual is incomplete posteriorly and in 2 pieces but probably only a short, posterior end is missing. The proboscis is everted about a third of the way. The prostomium is uniquely annulated, as originally stated; it has few rings, numbering only 5 ventrally and 4 dorsally (fig. 1). The anterior antennae have been torn away from the individual but in other respects the prostomium is complete. There is no indication of eyespots.

The proboscis is long and cylindrical. Its distal end terminates in soft papillae. Paragnaths consist of a pair of large macrognaths with the largest teeth on the dorsal end. Micrognaths include 15 in the dorsal, and 7 in the ventral arc. The chevrons at the sides, near the base, number 16 pieces on the right, and 20 pieces (fig. 2) on the left side; they are broadly V-shaped and very close together, resembling a solid dark mass when seen under low magnification.

The proboscidial organs are largest along the distal portion of the proboscis and diminish gradually basally as also in the grooves marking the longitudinal neural bands. They are of one kind but vary in size. All are tall, translucent cones, slightly beaked (fig. 9) toward the prostomial end and there is a subconical pore (fig. 8) that leads internally to a canal and externally to a furrow to the base of the organ. The base is usually bluntly equitriangular, but some organs that are shrunken appear slightly lobed at the base and hence might be thought to have a trilobed base, as Moore (1905) described. A large, nearly clear cell can be seen near the base of the organ. In structure and perhaps function these organs are much like those of *G. brunnea* (above) except that these lack the flaring outer membrane and are taller.

The parapodial change occurs at segment 34 and is more or less abrupt. Dorsal cirri are broadly foliaceous (figs. 3, 4). Notopodia consist of a longer, pointed presetal portion and a shorter, postsetal one. Neuropodia have a bilobed presetal portion that exceeds the single, postsetal lobe. In median segments the superior portion of the presetal lobe is the longer and distinctly rounded (fig. 4); farther back the 2 parts tend to be about equally long (fig. 3). In median and posterior parapodia the ventral cirri are inserted far proximal and do not extend distally to the end of neuropodial lobes.

Acicula are single and translucent yellow in color. They do not project beyond the parapodial lobes. Notopodial setae are simple, slender, distally pointed and number 8 to 12 in a fascicle. Neuropodial setae are composite spinigerous and far more numerous than notosetae (fig. 4). The shaft is approximately cylindrical through most of its length, but

at its distal end it is very much prolonged at its front, or cutting, edge and distinctly serrated (fig. 6); the lowest edge, at the back, is entire unless worn when it may appear frayed or split. The sides are gradually sloping. The appendage is long, pointed and knifelike along its length. It has a single row of small teeth (figs. 5, 7). Usually the articulations are seen in three-fourths view (fig. 7) giving the impression that the deepest part of the shaft is at the side instead of the back. A correct view can be had by slightly rolling the setae when observed under high magnification, or by detaching shaft from appendage.

Individuals identified as *G. annulata* Treadwell (1914, p. 198) from southern California have been examined and found to be otherwise, as follows: Station LXXI, off La Jolla in 15-57 fms, station LXXIII, off San Diego in 57-97 fms and station 1112, off La Jolla in 45 fms go to *G. brunnea* (see above). The record from station LXXIII off San Diego in 57-97 fms goes to *Glycinde armigera* (see below). A specimen reported from station 1122 off La Jolla in 100 fms, has not been found. All others are deposited in the Allan Hancock Foundation.

G. annulata Fauvel (1932a, p. 121) reported and redescribed from an individual off south Ceylon in 660 fms, is here believed to be different, in spite of similarities. The notopodium has a longer, conical, presetal lobe and a shorter, broader, postsetal one. Dorsal cirri are foliaceous and the proboscis has about 20 V-shaped pieces in each chevron. In these respects the 2 are similar. They differ thus: in *G. annulata* Moore the parapodial change is more or less abrupt at segment 33 or 34; in Fauvel's species 27 segments are uniramous, 21 are transitional, so that 48 segments are concerned. In the first dorsal cirri are sessile, in the second they are pedunculate. In the first notosetae are nearly twice as thick as neurosetae, in the second they are very slender and hairlike. The proboscidial organs are of a single kind in the first, or not noticeably different on ventral and dorsal sides of the proboscis. In the second they are arranged in longitudinal rows, larger on the dorsal than on the ventral side, and the latter are often depressed and distally bidentate. In the first the prostomium is distinctly annulate, whereas in the other it is indistinctly annulate.

G. echinulata Grube (1870, p. 67) from Brazil has been questionably referred to *G. annulata* Moore (Fauvel, 1932a, p. 121) but this seems very doubtful, even though the Brazilian species is incompletely known. In Grube's species the parapodial change is said to be at segment 46 instead of 33-34 and the chevrons number only 14, instead of 20, pieces on a side.

Distribution.—As herein defined, *G. annulata* Moore is known to occur from Alaska south to Lower California in deep water to 1400 fms.

***Goniada littorea*, new species**

Plate 3, figs. 1-10

G. brunnea Treadwell, 1914, p. 198 (in part).

G. uncinigera Hartman, 1940, p. 252. *Not* Ehlers, 1901.

Collections.—903-38 (5); 1441-41 (4); 1444-42 (1); 1445-42 (1); 1450-42 (12); 1451-42 (10); 1457-42 (2); Mission Bay, California, shore (3); Point Mugu, California, shore (1).

This species, unlike most of the genus, is small and intertidal. A complete individual (station 1450-42) consists of 175 segments and measures 70 mm long and 1 to 1.5 mm wide. Most of the other individuals consist of only 130 to 150 segments and the length may attain only 50 mm or less. The body is slender and filamentous seen with the unaided eye. Under magnification it is seen to taper gradually forward to a long, conical anterior end and prostomium. At the parapodial change the body widens perceptibly and is then almost uniformly broad and depressed. Segments (preserved) in both anterior and posterior regions are uniannulate. The change from uniramous to biramous segments is transitional, through segments 36 to 44.

In life the color of the body is dark or tawny yellow to yellowish tan. Some of the pigment and its pattern persists through preservation. The prostomium is pale but body segments are marked by 3 longitudinal rows of yellowish brown, segmentally arranged spots on both dorsal and ventral sides. An oval area occupies the middorsum and the midventrum of each segment and there are paired spots over the parapodial ridges. Intersegmental furrows are pale. The distal ends of parapodial lobes and cirri are dark yellow.

The prostomium is long and conical (fig. 1); it consists of 8 (or 9) rings; the distalmost ones are not clearly separated from each other. A single pair of eyes, visible in dorsal view, is embedded in the basal ring. The 4 terminal antennae are short and slender but distinctly biarticulate; each has a tiny distal article. The basal ring is somewhat longer and wider than its proximal ring.

The proboscis is long and cylindrical. It is pale except for the dark chevrons and paragnaths. Under low magnification its surface appears covered with coarse papillae, marking the distribution of proboscicial organs. The chevrons (fig. 5) consist of 16 to 18 V-shaped pieces on a

side; those near the middle of the series are the largest. There are 18 soft, terminal papillae, the largest on the ventral side. Macrognaths are large and have 5 or 6 teeth, the largest at the dorsal end. Micrognaths consist of a long, dorsal (fig. 4) and a short, ventral arc. The dorsal arc comprises 12 pieces in definite arrangement including (from one end to the other) one Y-shaped piece, 2 H-shaped pieces, one Y-shaped piece, 4 H-shaped pieces, one -Y-shaped piece, 2 H-shaped pieces and one Y-shaped piece. Micrognaths and macrognaths together form a complete circle.

Proboscoidal organs are coarse and numerous; they are distributed more or less regularly over the surface of the proboscis. They are yellow, translucent, hard, and stand moderately erect, presenting a prickly appearance when the proboscis is everted. They are of one kind but some are larger than others. All are disposed so that the large spine (figs. 9, 10) is directed orally. Each organ consists essentially of 2 hard, chitinized pieces; one is directed to the mouth and has a long projecting spine; the other is opposite and lacks a spine but has a sharp node that bounds the distal aperture. The 2 hard parts are held together by softer lateral parts and the entire structure is penetrated by a canal that leads to one or more large cells in the base. In general appearance these organs differ notably from those in *G. brunnea* (see above) but the differences are due largely to modifications of external parts.

Parapodia are uniramous (fig. 2) through 35 to 43 segments. They have long dorsal and ventral cirri that exceed the setigerous lobes in length. The latter consist of an elongate, triangular postsetal, and 2 presetal lobes of which the superior is slightly longer than the inferior one. Setae in these parapodia are entirely composite spinigerous. Acicula are pale yellow; they occur singly in rami and do not project from the parapodium. Biramous posterior parapodia (fig. 3) similarly have well developed dorsal and ventral cirri but the first are the longer. Notopodia consist of subequal presetal and postsetal lobes; the presetal one is slightly ventral in position. Notosetae are simple, slender and number 10 to 12 in a fascicle.

Neuropodia in posterior segments have a bifid, presetal lobe in which the inferior part exceeds in length the superior one; the postsetal lobe is prolonged at its upper edge as a triangular process (fig. 3). Neuroacicula resemble notoacicula but are slightly thicker. Neurosetae are entirely composite and have a spinigerous appendage. The shaft is cylindrical but at its distal end it is hollowed out for the insertion of the appendage. At its front margin (the side marking the cutting edge

of the appendage) it is serrated, thence slopes gradually at the sides to a concave back. These setae usually lie so that the articulation is twisted and seen in three-fourths view (fig. 8). The appendage has several (to 7 or 8) longitudinal rows of teeth. They are continued distally almost to the slender, pointed tip and basally nearly to the articulation. The teeth are arranged in trim, transverse rows (fig. 6). In cross section the appendages are somewhat oval (fig. 7) with the teeth arranged on the widest end of the oval. Although the number of teeth in a row is about the same near the base as near the tip, those distally are gradually slenderer and longer than those near the base.

Anal processes consist of a pair of long, slender, distally tapering structures that are about as long as the last 10 segments; they are inserted ventral to a pygidial papilla. In mature female individuals, ova occur first at about segment 48 and they are continued posteriorly in segments nearly to the end of the body. In this region they are numerous, closely packed, causing an extension of the body wall. In mature male individuals the spermaries are first present at about segment 43 and continued to near the end of the body. Epitokous individuals have not been observed.

G. littorea is characterized especially for the unique proboscicial organs and for the arrangement of micrognaths in that there are more in the dorsal, than in the ventral arc. The parapodial lobes of posterior segments are also specific. This species was earlier (Hartman, 1940, p. 252) recorded from southern California as *G. uncinigera* Ehlers (1901, p. 159) but the 2 are now believed to be distinct. The latter is poorly known; it originates from Corral, southern Chile in 5-6 fms. Its account was based on a single tiny individual only 13 mm long and consisting of 110 segments. Uniramous parapodia number about 39. The prostomium has only 7 rings. Chevrons of the proboscis number about 13 dark pieces on a side. The description is not clear concerning the structure and distribution of proboscicial organs. They were described as "von ungleicher Form und in ungleicher Dichte besetzt." Those from the middle of the proboscis are shown with a sharp, angled bent process directed orally and at its base there are 2 short, lateral processes. Near the oral end of the proboscis these organs are said to be blunt, with a short, abrupt point. The micrognaths are said to comprise 3 in the dorsal, and 9 in the ventral arc.

Although *G. littorea* and *G. uncinigera* are perhaps more nearly allied to each other than to other known species of the genus (especially because of the peculiarities of the proboscicial organs) there are sharp differences separating them, as shown above.

Records of *G. brunnea* Treadwell (1914, p. 198) from Deadmans Island near San Pedro, California, July 28, 1902, and from San Pedro, June 22, 1895 and July, 1898, also go to *G. littorea*, as I was able to confirm by examination of these collections, now deposited at the Allan Hancock Foundation.

G. littorea is an intertidal species, occurring in marine sloughs and estuaries, especially along the shores of southern California, north to Point Mugu. The substratum occupied is fine muddy sand at very low water line.

Holotype.—from station 1451-42 and paratypes, in the Allan Hancock Foundation.

Distribution.—This is known only from southern California.

Goniada quinquelabiata Augener

Goniada emerita quinquelabiata Augener, 1906, p. 158.

Goniada congoensis quinquelabiata Augener, 1918, p. 397.

Goniada magna Treadwell, 1945, pp. 2-3, figs. 6-8.

Material examined.—Type specimen of *Goniada emerita quinquelabiata* Augener, no. 2297 in the Museum of Comparative Zoology, Cambridge, Massachusetts, and type specimen of *Goniada magna* Treadwell, no. 3387 in the American Museum of Natural History, New York.

The type of *Goniada emerita quinquelabiata* is somewhat hardened and much twisted but in satisfactory condition to identify its significant characters. The length of the posteriorly incomplete specimen with 170 segments is about 130 mm. The prostomium agrees closely with that described below, for *Goniada magna* Treadwell; there are no eyespots. The basal ring has a pair of small foliaceous lobes at the sides, in line with the parapodia farther back.

The proboscis is only partly everted; the greater part is seen by dissection to extend back so that the paragnathal ring is in segment 25. The macrognaths are large, with 5 teeth each; micrognaths consist of similar dorsal and ventral arcs, each with 24 dark pieces. Chevrons number 19 pieces on one side and 15½ on the other. The proboscical organs are thickly strewn over the surface, closest and most numerous on the dorsal side, diminishing in number so as to be sparest on the ventral side. They are all of one kind; each consists of a small mound covered over by a chitinized sheath with a distal pore; on the abgnathal side of the pore is a longer spur directed distad and on the gnathal side a shorter spur directed obliquely upward; they resemble closely those shown in plate 6, fig. 6.

The first few parapodia agree closely with those described for *G. magna* (below). Notosetae are first present from setigerous segment 33; notopodia increase in size gradually through a long region so that by segment 85 the full size of parapodia is attained. Dorsal cirri are long and foliaceous. Notosetae are numerous in a fascicle and hairlike.

Parapodia are maculate in the posterior region; large dark areas are segmentally seen over the upper parapodial base, dorsal cirrus, presetal and postsetal lobes and ventral cirrus. The body cavity of this specimen is crowded with large ova.

On the type specimen of *Goniada magna* the distal end of the proboscis is dissected out and partly cut away. There are 21 pairs of chevrons, each patch an elongated oval with the smallest pieces at either end; the pieces are set close together but clearly separated from one another. The terminal papillae have been cut, but may number 16 or more. Macrognaths have 5 teeth each, gradually increasing in size; these were first described as "three-pronged denticles" since the 2 smallest teeth were embedded. Micrognaths are arranged in dorsal and ventral arcs that resemble one another; each has 20 or more pieces in an irregular double row. Since the proboscis is retracted they are crowded together. The proboscidial organs are small, closely set, and thickly strewn over the surface, but denser on the dorsal side, sparser on the ventral side. All are of one kind except that the dorsal ones are larger than the ventral ones. They agree exactly with those of *G. quinquelabiata* Augener (above).

The prostomium consists of a long, basal ring over half as long as the rest of the prostomium; it has transverse nuchal slits at the sides at about its midlength. This ring is unique for having at its sides, in line with the lateral parapodia, a pair of small foliaceous lobes that resemble a dorsal cirrus. The shorter, more distal prostomial rings are more depressed, number 8 counted at the sides, and the 7 distalmost are again weakly transversely divided on the dorsal side. All transverse rings are obscure on the ventral side. The distalmost is truncate in front; it has a pair of frontal, and a pair of more posterior, dorsolateral antennae. The first pair is only about half as large as the second. Each is biarticulate, with a larger basal, and a tiny, papillar distal article. No eyespots are visible.

The first parapodium consists of 3 long, triangular pointed lobes; its ventral cirrus is much the longest; its dorsal cirrus is flattened and the setal lobe is conical. This segment carries a small fascicle of setae. The second parapodium is similar to the first, but larger and its presetal

lobe is deeply bifurcated, also a small pointed postsetal lobe is first present. The third parapodium is similar to the second one, but the postsetal lobe surpasses the presetal ones in length. The dorsal cirrus also comes to be long, foliaceous and triangular.

A small but distinct notopodium is present on segment 32; this is followed by a long transition region in which notopodia gradually increase in size, to about segment 80-85. Notosetae are hairlike and numerous in a fascicle. Neurosetae are composite spinigers. The specimen is maculate as described above for *Goniada quinquelabiata*. This is believed to be identical with the latter, and is here newly referred to it.

Distribution.—*G. quinquelabiata* is known off New York in 466 fms, dredged by the *Blake* Expedition, and off Georges Bank, Massachusetts in 30 meters, dredged by the *Albatross*.

Goniada congoensis Grube

Grube, 1878a, pp. 532-533; Arwidsson, 1899, pp. 41-43, fig. 62; Monroe, 1930, p. 118.

This species, together with its subspecies, below, is characterized for having a midventral, longitudinal series of one or more rows of proboscicial organs that differ from the others. These have a rigid, clawlike base and a bifurcated distal end (see Arwidsson, 1899, fig. 62). A subdistal circle, possibly a pore is shown but no mention or explanation made in the text. An individual with 206-210 segments is about 61 mm long and 3.5 mm wide with parapodia. The first 27 segments are uniramous; others are biramous. Notosetae are simple and hairlike. Notopodia have a postsetal lobe that is as long as the presetal one.

Proboscicial organs are of 2 kinds; most that cover the surface are conical and pointed. Along the midventral length there are 4 longitudinal rows that have furcated tip. Chevrons number 13-14 on a side. Macrognaths have 4 large teeth; micrognaths consist of a dorsal arc of 25-29 pieces and a ventral arc of 15 pieces. All the micrognaths are H-shaped except the most lateral ones in the dorsal arc which are Y-shaped.

Distribution.—This is known only from the Congo coast and Angola, Portuguese West Africa.

Goniada congoensis hupferi Arwidsson

G. hupferi Arwidsson, 1899, pp. 40-41; Augener, 1918, pp. 396-397.

This differs from the stem species mainly in the comparative lengths of parapodial lobes. In neuropodia the postsetal bifurcated lobe is shorter

than the single presetal one, whereas in the stem species the single presetal lobe is slightly longer than the bifurcated postsetal lobe. In the subspecies the notopodia have a postsetal lobe that is much longer than the presetal one, whereas in the stem species the presetal and postsetal lobes are about equally long.

An individual with 175 segments measures 30 mm long and 2 mm wide with parapodia. The first 27 segments are uniramous. Biramous parapodia have simple, hairlike notosetae and composite spinigerous neurosetae. The prostomium has not been described. The proboscis has 14 chevrons on a side. Macrognaths have 3 or 4 teeth each. Micrognaths consist of a dorsal arc of 15 or 16 pieces and a ventral one of 8 pieces, together forming a circlet. All micrognaths are H-shaped except the outermost one on each side of the dorsal arc which is smaller and Y-shaped. The micrognaths vary much in size.

The proboscidian organs are strewn over the proboscis in 18 longitudinal bands, with 2 or 3 irregular rows on each band. Most organs are rounded and somewhat ovate but those on the dorsal side are the larger. Each has at the tip about 3 small teeth (not known for the stem species). Those in the midventral line resemble those of the stem species.

Distribution.—West Africa. (This was given as Sinai by Arwidsson, 1899, but as Sinoe, Liberia, by Augener, 1918.)

Goniada maorica Benham

Goniada eximia Benham, 1909, p. 80. *Not* Ehlers, 1901, p. 157.

Goniada maorica Benham, 1932, pp. 555-561, figs. 1-5.

Length of an incomplete specimen is 210 mm for 220 segments; width is up to 12 mm with parapodia. The body consists of 3 regions; the transition from uniramous to biramous parapodia is gradual, occurring between segments 70 to 112, with about 40 segments comprising a middle body region. The prostomium has a larger basal ring that is traversed by a furrow, and 7 more terminal rings with 4 antennae. Eyes are absent.

Uniramous parapodia have 2 long, subequal presetal and a slightly longer postsetal lobe; both dorsal and ventral cirri are long and conspicuous. In median segments the ventral cirrus is rapidly enlarged so as to exceed all other parapodial lobes in length.

Notopodia have a single setal lobe that resembles the dorsal cirrus, and a few hairlike simple setae. Neuropodia in the posterior region have 2 longer, subequal presetal lobes and a shorter, triangular postsetal lobe,

prolonged at its middle, and a ventral cirrus again much smaller than that in median parapodia. Neurosetae are composite spinigers in fan-shaped fascicles.

The proboscis has a distal circlet of 18 or 20 soft papillae. Macrognaths have 4 large clawlike teeth. Micrognaths form a complete circle, with about 23 pieces in the dorsal and 16 in the ventral arc. Chevrons number 26 pairs. The proboscical organs are conical with blunt apex and a minute pore nearly halfway down one side.

Distribution.—New Zealand, east coast.

Goniada falklandica Pratt

Goniada norvegica falklandica Pratt, 1901a, pp. 3-6, pl. 4, figs. 2, 4, 6, 7, 13.

Goniada eximia Ehlers, 1901, pp. 157-159 (in part). See below.

An ovigerous individual with 182 segments measures 140 mm long and 10-11 mm wide with parapodia; the everted proboscis measures an additional 40 mm long. The prostomium consists of 9 rings and has 4 terminal antennae; eyes were not described. The everted proboscis is cylindrical; it has 4 pairs of chevrons, the largest one at the base. The terminal end of the proboscis has 17 fleshy papillae. Macrognaths have 3 larger and 2 smaller clawlike teeth (Pratt, fig. 6). Micrognaths number 15 in the dorsal and 17 in the ventral arc. Anterior uniramous parapodia number 55. A small notopodium appears at the 56th segment and increases in size gradually; the transition region is thus not abrupt, but the number of transitional segments is not stated. Notosetae are hairlike. Neuropodia have a bifurcated presetal lobe and a broad foliaceous postsetal lobe, as characteristic of most species of the genus. Neurosetae are composite spinigers.

G. falklandica was thought (Pratt, 1901) to have its affinities with the boreal *G. norvegica* Oersted, but from the latter it differs sharply in having a much higher number of uniramous segments, 55 in the first and 33 to 37 in the second. The first has only 4 pairs of proboscical chevrons, the second has 15 to 20 pairs. *G. falklandica* agrees with *G. eximia* Ehlers (1901, in part, including only the smallest specimen) in having only 4 pairs of chevrons. Ehlers described a transitional parapodial change from about the sixtieth segment. A specimen 77 mm long consists of 168 segments. The first 3 parapodia are more weakly developed than those immediately behind. Micrognaths number about 24 and are arranged in a circlet. Macrognaths have 3 larger and 2 smaller teeth. These characters resemble those described for *G. falklandica*, but are

different from those of the other 2 specimens which Ehlers used in describing *G. eximia*, herein referred to *Ophioglycera eximia*, below.

Distribution.—*G. falklandica* is known from the Falkland Islands in 3 fms, and possibly off Cabo Espiritu Sound, Patagonia (Ehlers, 1901).

? *Goniada eximia*, sensu Monro, 1937

Goniada eximia Monro, 1937, p. 285. *Not* Ehlers, 1901, p. 157, *nor* Monro, 1936, p. 141, *nor* Benham, 1909, p. 80.

A specimen with 252 segments measures 250 mm long and 4 mm wide without parapodia. The proboscis has 18 pairs of chevrons; this is thus a species of *Goniada* and not the same as *G. eximia* Ehlers (1901) which goes to *Ophioglycera* (below). The parapodial change is transitional, between segments 58 and 96. Notosetae are hairlike. Macrognaths have 5 teeth each; micrognaths number about 30 and are arranged in 2 irregular rows. The specimen is incompletely known but its affinities appear to be with the species related to *G. maculata* Oersted. It is also noteworthy that *G. maculata* was recorded from the Iranian Gulf by Wesenberg-Lund (1949, pp. 296-297), thus not far from the locality of Monro's specimen.

Distribution.—*G. eximia* Monro (1937) is recorded from the North Arabian Sea in 1519-1705 meters.

***Goniada acicula* Hartman, revised**

Plate 4, figs. 2-7

Hartman, 1940, pp. 252-254, pl. 44, figs. 132-141.

G. emerita Hartman, 1944b, p. 19. *Not* Audouin and Edwards, 1834.

Collection.—1107-40 (1).

Individuals from the Gulf of California (Hartman, 1940) and others from tropical west Atlantic (Hartman, 1944b) differ from each other in some details but they are now believed to have less than specific significance. On the whole the first are darker, larger and more robust than the second. In both the body is divided into 3 regions, an anterior uniramous one with about 63 segments (Gulf of California) or only 53 segments (Atlantic side). The middle region consists of segments 64 to 93 (Gulf of California) or segments 54 to 79 (Atlantic side). The posterior region is abruptly broader than the middle one. Chevrons number 10 to 13 pieces on a side. Micrognaths consist of 13 or 14 pieces in the ventral, and 15 to 17 pieces in the dorsal arc. The prostomium has 10 rings.

Proboscoidal organs vary somewhat. Those from the Gulf of California are slightly more striated in their flaring edge (figs. 4-7) than are those of the others (figs. 2, 3). In both, the flange is noticeably less broad than that in *G. brunnea* (pl. 1, fig. 6). The stalk is sometimes extended so as to appear like a funnel. Various views of similar organs are shown in the small sketches in fig. 7.

G. emerita (Hartman, 1944b, p. 19) from Colombia and Venezuela, is here referred to *G. acicula* since there are 3, not 2, body regions and the prostomium has 10, not 8 rings.

Distribution.—*G. acicula* is recorded from both sides of tropical America, in the Gulf of California and Ecuador, and from Colombia and Venezuela, in shallow water to 40 fms.

Goniada emerita Audouin and Edwards

Fauvel, 1923, pp. 391-392, figs. 154 h-q.

Goniada longicirrata Monro, 1937, pp. 285-286, figs. 12 a-c. *Not* Arwidsson, 1899.

Length of a complete specimen of *Goniada longicirrata* Monro (1937) with 145 segments is 40 mm and width with parapodia is 1 mm. The anterior uniramous region consists of about 57 segments and the transition to the biramous condition is abrupt. Notopodia have few (about 2) heavy acicular setae, and neuropodia have only composite spinigers. The proboscis has between 12 and 15 pairs of chevrons. The distal macrognaths have 3 teeth. Micrognaths are arranged in a complete circlet; they number about 22 in 2 irregular rows of larger and smaller plates. The proboscoidal organs are shown (Monro, fig. 12c) roughly equitriangular, with a passage running up from the exterior to the central canal. Neuropodia have a bifurcated presetal lobe that is longer than the single, tapering postsetal lobe. The dorsal cirrus is not elongated.

This specimen was questionably referred to *G. longicirrata* Arwidsson (1899) since the biramous region begins a little more forward than in *G. emerita*, and the number of teeth (3) in the macrognaths is low for the latter. However, to me these differences seem less significant than others, such as the greatly elongated cirri of Arwidsson's species.

Distribution.—Western and southern Europe; south Arabian coast in 16-22 meters and Red Sea in 256 meters (Monro, 1937).

***Goniada teres* Treadwell, revised**

Treadwell, 1931, pp. 5-6, figs. 9-12.

Material examined.—Type specimen from Montego Bay, Jamaica, in the American Museum of Natural History, catalogue number 2068.

This is a long, slender species, as first described. The proboscis as originally shown (Treadwell, 1931, fig. 19) is not fully everted as was presumed, but only halfway, thus the distal structures were not observed. Oral paragnaths are present and lie within, just behind the peristomial ring. The species is thus not unique for lacking these structures. The length of the everted proboscis was given as 9 mm; actually it would be about 18 mm if fully thrust out; its width is less than 0.4 mm.

The first 49 segments are uniramous; a small notopodium is first present at the fifteenth and in 8 segments it is abruptly larger; the transition region is short, including about 8 or 9 segments.

The prostomium has a long basal ring and 9 shorter more distal ones; the distal one is somewhat truncate triangular and has the 4 biarticulate antennae attached to it, the more anterior pair below and the second, slightly larger pair somewhat behind and above the anterior ones. The distal article is tiny, beadlike, the basal one long, clavate. Prostomial eyes have not been distinguished.

The proboscis is very long, cylindrical and only half everted. The chevrons are paired, near the base, number 10 on a side. Numbered from the base of the prostomium the basal piece is slenderest and broadly V-shaped. The seventh to ninth pieces are the largest and the tenth (last) piece is most sharply acute and short. Macrognaths are dark brown and sharply toothed, with 3 larger and one or 2 smaller points. The largest tooth is at the dorsal end, and the smallest at the ventral end. Dorsal and ventral arcs of micrognaths are present, most numerous in the first; they number about 10 larger and nearly as many smaller pieces in an irregular row (retracted); the ventral ones are similarly arranged but the number perhaps only 8 larger and some smaller pieces.

The proboscical organs are about evenly distributed over the proboscical length. All are of one kind and similar in size. They are well spaced from one another so that the uncovered surface of the proboscis is several times that which is covered. Each organ is of the kind shown for *Glycinde armigera*, piece III (see plate 6, fig. 6), or similar to those of *Goniada littorea* (pl. 3, fig. 9). Each is a hard, chitinized hemispherical process with an upper pore and a sharp tooth at the end directed away from the gnathal end; a much shorter process is at the opposite side of the distal pore.

The first parapodium is small; it has 3 long, triangular lobes including a dorsal cirrus with a boss at the base, a postsetal lobe and a ventral cirrus. On the second parapodium the presetal lobe is much the longest but the 3 lobes are similar in other respects. Farther back the neuropodium increases in size. At the sixth parapodium the presetal lobe acquires a slender, inferior spur, the beginning of the bifurcated presetal lobe. This branch comes to be gradually larger so that by the fourteenth parapodium the 2 presetal lobes are about equal. A single small postsetal lobe is first seen at the sixth parapodium; it gradually increases in size so as to be clearly visible at the twelfth; it remains far shorter than the presetal lobes but is similar in other respects. The ventral cirrus is the longest and broadest lobe in most anterior segments; it is dark brown except for the ivory tip. In biramous parapodia the notopodium consists of 2 broadly triangular lobes that are dark brown, with the pale yellow, bluntly tapered few (to 3) acicular setae projecting from them. The neuropodium comes to be broad, with a large, foliaceous, acutely pointed postsetal lobe and deeply bifurcated presetal lobe. The ventral cirrus remains large, brown, but is not conspicuous as in front, since the neurosetal lobes surpass them. Notosetae are bluntly acicular, few, one to 3 in a bundle; neurosetae are composite spinigers, in fanshaped fascicles.

Distribution.—*G. teres* is known only from Montego Bay, Jamaica, British West Indies.

Goniada grahami Benham

Benham, 1932, pp. 561-565, figs. 6-9.

Length of 280 segments is about 230 mm. Anterior uniramous segments number 88-90, with 2 or 3 transitional segments in which the notopodium is abruptly developed. The prostomium has a large basal ring and 6 shorter distal ones, with 4 antennae at the end. Uniramous parapodia have 2 long, digitate lobes, a much shorter postsetal lobe and dorsal and ventral cirri both prolonged, the ventral one exceeding all other parapodial lobes in length and width. Biramous parapodia have short lobes throughout. Their notopodia have dorsal cirrus and setal lobe about equally long, acuminate at the tip but broad at the base, and 3 coarse, acicular short spines in a fascicle. Neuropodia have broadly bifid presetal lobes, a single, equally long postsetal lobe and a much shorter ventral cirrus. Their separate lobes are broad at the base and taper to acute short tips. Neurosetae occur in fanshaped fascicles; they are entirely composite spinigers.

The proboscis has 24 pairs of chevrons, the smallest piece at the gnathal end, and increasing in size posteriorly. The distal end terminates in 19 fleshy papillae. Macrognaths have 4 clawlike teeth each. Micrognaths number 35 in the dorsal and 24 in the ventral arc; they consist of pieces of varying sizes. The proboscidian organs are soft, have rounded apex and are said to be varying in size; each has a pore near the apex and a distinct groove on one side, running from the base to the apex.

Distribution.—*G. grahami* is known only from off Otago, New Zealand; it was taken from stomach contents of a flounder.

Goniada japonica Izuka

Goniada japonica Izuka, 1912, pp. 232-234, pl. 23, figs. 1-6.

A complete specimen of 327 segments is 225 mm long and 2.5 mm wide with parapodia. Anterior uniramous segments number 76, followed by 2 transitional segments; posterior biramous segments number 251. Notosetae in biramous segments are few and acicular.

The prostomium has 9 annuli. It terminates in front in 4 antennae in which the ventral ones are slightly the larger; eyes have not been noted. The proboscis has 18 pairs of chevrons. The distal end terminates in 16 fleshy lobes. Macrognaths have 2 larger and 2 smaller clawlike teeth each, or only 2 larger teeth. Micrognaths number 16 in the dorsal, and 11 in the ventral arc. The proboscidian organs are described as heart-shaped and leaflike, and are sparsely distributed in regular rows.

Distribution.—This is known only from Japan.

Genus *Ophioglycera* Verrill, 1885, revised

Type *O. gigantea* Verrill

The body consists of 3 regions, an anterior one with uniramous parapodia, a middle one in which notopodia are gradually developed, and a posterior one in which parapodia are clearly biramous. Noto-setae are simple, slender to somewhat acicular; neurosetae are composite and spinigerous, far more numerous than notosetae and arranged in fanshaped fascicles. The prostomium is conical and externally annulate, the basal ring much the longer; the 4 terminal antennae are biarticulate. The proboscis is long and cylindrical to somewhat clavate. It terminates in front in a circlet of soft fleshy papillae within which is a circlet of macrognaths and micrognaths. Chevrons are absent. The proximal surface of the proboscis is covered with organs that resemble papillae, but may be variously modified with structures resembling those in *Goniada* (above).

Parapodia have conspicuous foliaceous to lancet-shaped dorsal and ventral cirri. The neuropodium in its presetal portion is broadly bifurcated; the postsetal lobe is broader, foliaceous or elongate triangular in shape.

Ophioglycera Verrill was erected for a single species, *O. gigantea* Verrill (1885b, p. 436) from Rhode Island; the same species was later named *O. grandis* Verrill, when only some figures were published (Verrill, 1885a, pl. 42, fig. 185). Aside from these 2 references, the name has remained obscure or unknown, largely because it was not possible to include the genus, as known, with other members of the family GONIADIDAE. The prostomium had been described as a simple semicircular lobe without appendages. Arwidsson (1899, p. 31) stated, however, that such was hardly the case since they are not lacking in other representatives of the family. Also, he presumed that it is doubtful if the genus should not be referred to *Goniada* (Arwidsson, p. 32).

A reexamination of the specimen on which Verrill based at least part, if not all, of his description, has verified Arwidsson's surmisal that 4 antennae are present, but that it does not go to *Goniada* Audouin and Edwards, since chevrons are totally lacking and parapodial parts are different.

Ophioglycera gigantea Verrill is here believed to be closely related to and congeneric with several other species from widely scattered geographical areas. They are *Goniada eximia* Ehlers, 1901 (in part), *Goniada (Leonnatus) foliacea* Moore, 1903, *Goniada distorta* Moore, 1903 and *Goniada longicirrata* Arwidsson, 1899.

KEY TO SPECIES OF *Ophioglycera*

1. Dorsal cirri slender and greatly prolonged *O. longicirrata*, p. 40
1. Dorsal cirri not nearly so long 2
2. Prostomium with a longer basal and 3 smaller distal rings; parapodial change at about segment 35 . . . *O. foliacea*, p. 40
2. Prostomium with 8 or 9 rings 3
3. Parapodial change gradual, between segments 55 to 90 . . . *O. gigantea*, p. 37
3. Parapodial change more or less abrupt, at about segment 58-59 4
4. Proboscoidal organs all of one kind *O. eximia*, p. 38
4. Proboscoidal organs of 2 kinds *O. distorta*, p. 39

Ophioglycera gigantea Verrill, revised

Plate 5, figs. 1-3

Ophioglycera gigantea Verrill, 1885b, pp. 436-438; Arwidsson, 1899, pp. 31-32; Hartman, 1944a, p. 339, pl. 47, fig. 1, pl. 50, fig. 4, pl. 57, fig. 1.

Ophioglycera grandis Verrill, 1885a, pl. 42, fig. 185.

Material examined.—Off Prudence Light, Narragansett Bay, Rhode Island in 14½ fms, bottom sandy mud broken shells, collected August 31, 1880, U.S. Fish Commission Steamer *Fish Hawk*, locality 846 (1 specimen).

The available individual was dredged and is thus not the epitokous one used by Verrill (1885b) but the label in the vial is believed to be in Verrill's handwriting and undoubtedly represents the same species as the type taken in the same locality. The appended label reads "off Newport, R.I. U.S.F.C. 1880, Loc. 846," together with the name of the species.

The specimen is fixed and preserved in an awkward misplacement such that the prostomium and first 30 segments are entirely telescoped within the last 37 segments of the piece. The prostomium is thus withdrawn to the inside of segments 67 and the anterior segments are reversed so that exterior parts lie within. Furthermore, the proboscis has been completely dissected away in such manner that the basal end of the dorsal side of the prostomium is also cut away, but the ventral side of the prostomium is intact and firmly connected with the body.

Contrary to the original account, the prostomium is not smoothly rounded in front, but is annulated and conical, as in other members of the GONIADIDAE. It consists of a depressed lobe, ending in front in 4 short antennae (fig. 1). The prostomial rings number 8 or 9, including the incompletely separated distalmost ring. At the sides and dorsally the rings are uniannulate, but ventrally each ring is crossed by a shallow, transverse sulcus. No eyes have been seen but the ocular areas on the sides of the basal ring have been dissected away.

The first few parapodia are small and inconspicuous but they increase in size gradually. By the third segment the bifurcated setal lobe and the long dorsal and ventral cirri are already well developed. Farther back these parts increase in size and the presetal lobes diverge so that the acicular lobe can be seen between them (fig. 2). The postsetal lobe is long, triangular and surpasses the presetal lobes. Composite setae emerge in a spreading fascicle but the uppermost and lowermost ones are continued so as to partly surround the presetal lobes at their upper and lower bases.

A small, dorsal ligule (fig. 3) representing the beginning of the notopodium, is first present on segment 59. It is uniformly developed through about 8 segments, or to the end of the piece available for study. It is supported by a slender, yellow notoaciculum. Neurosetae are entirely composite, slender and spinigerous.

The original and only known account was based partly on what I take to be an epitokous individual, since it was taken at night, while swimming at the surface. It measured 20 inches long and nearly half an inch wide. This specimen is now supposedly deposited in the United States National Museum (I have been unable to examine it). I suggest that it is perhaps only a posterior (or also median) region of an individual that was much longer when complete, and that the anterior uniramous region was altogether lacking. Verrill presumed it to be entire since he stated (1885b, p. 437) that the first parapodia were biramous. According to Verrill's illustration (1885a, pl. 42, fig. 185) at least 90 segments may be involved in the transitional region, or those segments in which notopodia increase gradually in size; the posterior region consists of many more segments. What Verrill described as "head. . . obtusely rounded in front, smooth," was perhaps only the healed-over segment of a transitional segment at which autotomy had occurred. However, another individual, possibly the same as that on which the present account is based, was used by Verrill, since the proboscis was partly described. It was said to be armed with a ring of paragnaths including a pair of macrognaths and dorsal and ventral arcs of micrognaths. The proximal surface was said to appear granular under a hand lens, hence covered over with proboscidial organs; chevrons were not noted; I believe they are absent.

Distribution.—*O. gigantea* Verrill is known only from Rhode Island in shallow water.

Ophioglycera eximia (Ehlers), new combination

Goniada eximia Ehlers, 1901, pp. 157-159, pl. 20, figs. 7-17 (in part);

Monro, 1936, p. 141; Fauvel, 1941, p. 285.

Not Benham, 1909, p. 80, or Monro, 1937, p. 21.

This species agrees with the genotype, *O. gigantea* (above) in lacking proboscidial chevrons and has similar bifurcated lobes in neuropodia. Among the 3 specimens which Ehlers (1901, p. 157) had, only 2 belong here. They come from Santa Cruz, shore, and Tribune Bank, 25 fms. The other, smallest specimen, from Cabo Espiritu Sound, is a *Goniada* species, since it has chevrons (see *Goniada falklandica*, above).

O. eximia is characterized in having a prostomium with a large basal, and 8 shorter distal annuli; there are 4 distal antennae; eyes are lacking. The parapodial change from uniramous to biramous condition occurs at segment 57 or 58, and is presumed to be abrupt. Notopodia where best developed, have 8 to 10 simple pointed setae; neuropodia have 80 or more composite spinigers.

The proboscis is covered with blunt organs (described as "kleinen, schuppenartigen, stumpf kegelförmigen Papillen"). The larger macrognaths have 3 larger and a fourth small tooth. Micrognaths are arranged in a shorter ventral arc of 15 to 18, and a longer dorsal arc of 19-22 pieces.

O. eximia, sensu Monro (1936, pp. 141-143) from the Falkland Islands, shore, seems to belong here. The specimen is 760 mm (nearly 30 inches) long and up to 13 mm wide without parapodia; it has over 258 setigerous segments. This is thus perhaps one of the largest goniadids known. Macrognaths have 5 (not 4, as Ehlers stated) teeth and micrognaths consist of 22 X-shaped pieces together with an accessory series of smaller ones in a second row. The parapodial change is at segment 59.

Goniada eximia Monro (1937, p. 21) from abyssal depths in the north Arabian Sea, is not the same but a species of *Goniada* (see above). *Goniada eximia* Benham (1909) has been renamed *Goniada maorica* Benham (1932).

Ophioglycera distorta (Moore), new combination

Goniada distorta Moore, 1903, pp. 461-464.

This species is referred to *Ophioglycera* since it lacks chevrons. Length of 106 segments (incomplete) is 66 mm; width in the anterior region is 2.8 mm with, 2 mm without parapodia; width in posterior segments is 3.7 mm with, 1.3 mm without parapodia. The prostomium is annulate, with a long basal ring that is about $\frac{1}{3}$ of the total length of the prostomium, and 8 more distal annuli. Eyes are absent. The anterior uniramous part consists of 53 segments, but notosetae are not present before segment 65. They are slightly curved, acicular, few in a segment and heavier than the composite spinigers in neuropodia.

Neuropodia consist of 2 presetal and one postsetal lobe of which the dorsal presetal is slightly the longer, the postsetal one the shorter. The ventral cirrus is large so as to extend beyond other lobes at the posterior end of the uniramous part. The pharynx (proboscis retracted) extends back to segment 42. Chevrons were not described and are

presumed to be absent. Proboscoidal organs are of 2 kinds; very numerous, bluntly conical ones are irregularly dispersed over the proboscoidal surface, and somewhat larger ones with compressed bifid summits occur more sparingly and are confined to the muscular ridge. Both have the cuticle thickened and a single sensory pore just behind the apex. Macrognaths are black, somewhat dorsal, each with 4 clawlike teeth, diminishing in size dorsally. Micrognaths number 13 in the dorsal and 18 in the ventral arc.

Distribution.—*O. distorta* is known only from Suruga Bay, Japan in 35-65 fms.

***Ophioglycera foliacea* (Moore), new combination**

Goniada (*Leonnatus*) *foliacea* Moore, 1903, pp. 457-460, pl. 26, figs. 75-76.

This species agrees with the genotype of *Ophioglycera* in lacking proboscoidal chevrons and in having similar parapodial parts. The prostomium has only 4 rings, including a basal one that nearly equals the 3 distal ones together; they terminate in 4 antennae. A specimen nearly complete measures 98 mm long for 160 segments. The parapodial change from uniramous to biramous is at about segment 35, with only a few segments transitional. Notosetae are slender, simple and distally pointed. Neurosetae are composite spinigers, arranged in fanshaped fascicles. On the proboscis the macrognaths have 2 larger and 2 or 3 smaller clawlike teeth. Micrognaths number 14 or 15 in a shorter dorsal arc and 28 to 30 in a longer ventral arc.

This species differs from others in the genus in having a short anterior region (about 35 segments) and few prostomial annuli.

Distribution.—*O. foliacea* is known only off Japan in 62-190 fms.

***Ophioglycera longicirrata* (Arwidsson), new combination**

Goniada ? *longicirrata* Arwidsson, 1899, pp. 47-48.

This species lacks proboscoidal chevrons, hence is referred to *Ophioglycera*. A specimen measuring 34 mm long consists of 165 segments. Dorsal and ventral cirri in the anterior region are conspicuously longer than is typical for other species of the family GONIADIDAE. The parapodial change from uniramous to biramous occurs at segment 58. Notopodia have about 3 large, acicular spines; neuropodia have composite spinigers in fanshaped fascicles. Macrognaths are said to have only 2 teeth; micrognaths number only 6 (probably) in the ventral series and are lacking from a dorsal one. The prostomium was not described.

Goniada longicirrata Monro (1937, pp. 285-286, figs. 12 a-c) from south Arabia and the Red Sea, is not the same Arwidsson's species, since it has proboscoidal chevrons; this name is referred to *Goniada emerita*, above.

Distribution.—*Ophioglycera longicirrata* is thus known only from Terand-Vaso, west Africa.

Genus *Goniadopsis* Fauvel, 1928

Type *G. agnesiae* Fauvel

This genus is characterized for having the body divided into 3 regions, an anterior one with uniramous parapodia provided with short cirri and falcigerous composite setae, an intermediate region with uniramous parapodia with long cirri and spinigerous composite setae, and a posterior region with biramous parapodia in which notopodia have acicular setae and neuropodia have long, spinigerous, composite setae. The proboscis lacks chevrons.

Only 2 species have been referred to the genus, they are *G. agnesiae* Fauvel (1932a, p. 122) from the Indian Ocean, and *G. incertae* Fauvel (1932a, p. 122) from Burma. A third, described as *Glycinde maskallensis* Gravier (1904, p. 475) from the Red Sea, is here believed congeneric; it is newly named *Goniadopsis maskallensis* (Gravier). The genus is not known to be represented outside the stated areas.

Genus *Goniadella*, new genus

Type *G. gracilis* (Verrill)

The body is slender; it consists of anterior and posterior regions but they are not sharply set off from each other; a middle region is lacking. The prostomium is clearly annulated and has about 8 rings. It ends distally in 4 long, slender, biarticulate antennae. There are eyes in the basal, or perhaps also in the distal ring. The proboscis is covered with organs of a single kind and there are paired chevrons at the sides, near the base. Macrognaths are dentate, probably ventro-lateral in position. Micrognaths consist of small H-shaped pieces in dorsal and ventral arcs.

Parapodia are uniramous through about 30-35 segments and thereafter biramous. Neuropodia have a simple, longer, presetal lobe and a simple, blunt, postsetal one. Ventral and dorsal cirri are elongate and triangular. Notoetae are simple. Neuroetae are composite; they include both falcigerous (pl. 5, fig. 5) and spinigerous ones in all parapodia.

Goniadella differs from *Goniada* (see above) in that neurosetae include both falcigerous and spinigerous ones; the presetal neuropodial lobe is entire, not bifurcated. *Goniadella* agrees with *Goniadopsis* (see above) in having falcigerous composite setae, but in the latter these setae are limited to anterior segments; also, chevrons are present in *Goniadella*, absent in *Goniadopsis* Fauvel.

***Goniadella gracilis* (Verrill), new combination, revised**

Plate 5, figs. 4-8

Eone gracilis Verrill, 1873, p. 596.

Goniada gracilis Verrill, 1880, p. 172; Webster and Benedict, 1884, pp. 723-724, pl. 5, figs. 49-52; Hartman, 1944a, p. 339, pl. 47, fig. 2, pl. 50, fig. 3.

Material examined.—Off Newport, Rhode Island, USFC 1880, locality 805, steamer *Fish Hawk*, August 17, 1880, at Browns ledge in $11\frac{1}{4}$ fms, on fine gravel (1); off Cape Cod, Massachusetts at low water, USFC, August 14, 1879 (1).

These collections were borrowed from the Peabody Museum of Natural History at Yale University. The first was labeled *Goniada gracilis*, the second *Goniada maculata* Oersted, but both belong to the same species and are referred to *Goniadella gracilis* (Verrill). Both individuals are now more or less hardened and brittle. They are tiny and twisted so that total length is difficult to estimate; they approximate 20 mm long, as first stated. Large ova in the body cavity indicate that the specimens were perhaps mature. The body is strongly annulated, but anterior rings are crossed medially by a shallower, transverse ring. In its posterior part, the body resembles that of some lumbrinerids, in that the segments are moniliform; the long presetal lobe tends to stand erect.

The prostomium consists of 8 sharply separated rings and is slightly depressed (fig. 8). Its anterior margin has 4 slender, prolonged antennae in which the distal article is much slenderer than the base. A pair of reddish eyes is visible in the basal ring, as originally stated, but there is also a second pair of eyes in the distal ring.

The proboscis is partly everted in one individual. It is covered with minute proboscidial organs that are now too shrunk to determine their form. Each side of the proboscis has chevrons, numbering about 26 very closely spaced pieces (fig. 6); this area is nearly 3 times as long as wide. Paragnaths are dark horny brown. Macrognaths have each about 4 strong, clawlike teeth. Micrognaths consist of a longer

arc of 10 H-shaped pieces and 2 or 3 tiny ones believed to be dorsal, and 3 larger H-shaped pieces in a short arc thought to be ventral (the doubt is due to imperfect material).

The first 30 or 31 segments are uniramous and the separation between anterior and posterior regions is not sharp. Only the presence of spinelike notosetae indicates a change from anterior to posterior regions. Neuropodia do not change greatly from front to back, except that the setal lobes enlarge somewhat in going back, and the spinigerous setae come to be very long in postmedian segments, perhaps signaling an approach to epitoky. The presetal lobe is long and entire; it extends far beyond the blunt, entire postsetal lobe (fig. 7). Farther back, in posterior segments, the presetal lobe comes to be somewhat erect but it is still entire. Notopodial lobes are small and nowhere conspicuous. In the figure they are shown in dotted outline.

Notosetae consist of 3 or 4 blunt, slightly curved, acicular, yellow spines in each notopodium. They project for some distance from the lobe. Neurosetae are entirely composite; they include both falcigerous and spinigerous ones in all neuropodia where they have been observed (in some segments they are distally broken off). The falcigerous setae occupy a position in superior and inferior ends of the fascicle; they number usually only one to 3 or 4 in any position. Spinigerous setae are in median (fig. 7) positions and much longer. Those in posterior segments are far longer than similar ones in anterior segments.

Goniadella gracilis was originally described only approximately so that its generic characters have remained obscure. The prostomium has 2, not one, pairs of eyes; the so-called bilobed neuropodium is actually entire and not to be confused with the ventral cirrus. Setae were said to be long, slender, acute and many of them curved. Actually, they consist of spinigerous and falcigerous appendaged ones, in definite pattern.

This species was first referred to *Eone* (Verrill, 1873, p. 596) and later to *Goniada* (Verrill, 1880, p. 174) with the explanation that the proboscis has chevrons (called V-shaped denticles) and jaws as in *Goniada*. Webster and Benedict (1884, p. 723) redescribed the species, but for the setae stated only that they are "short, simple, a little curved at the apex." Also, short and long ones are shown intermingled with one another, instead of occupying definite positions in the fascicles. The distal prostomial eyes were shown, not in the distal ring, but in the third ring from the end. The proboscis was not described. Because of these errors, Arwidsson (1899, p. 34) was unable to place the species in his grouping of the family.

In so far as I know, this remains the only species in the family that can be referred to the genus.

Distribution.—*Goniadella gracilis* is known from Gays Head, Massachusetts in 19 fms, off Cape Cod, Massachusetts, in intertidal zones, and off Rhode Island, in 11 $\frac{1}{4}$ fms.

Genus **Glycinde** Müller, 1858

Type **G. multident** Müller

Includes *Eone* Malmgren, 1866 and *Epicaste* Kinberg, 1866.

The prostomium is long, conical and more or less strongly annulated; it terminates in front in 4 small, biarticulated antennae. There are usually eyes in the basal ring or also in the distal one. The proboscis is long and cylindrical; distally it is provided with a row of soft, terminal papillae within which are the paragnaths. The latter include a pair of large, dentate macrognaths ventrally or ventrolaterally, with the largest teeth on the dorsal end, and smaller micrognaths. In most known species of the genus, the micrognaths are limited to a dorsal arc, but there may be also a short, ventral arc. The proximal portion of the proboscis is more or less completely covered with longitudinal series of horny yellow, spinous processes or proboscidial organs. They are arranged in patterns so that individual ones may be recognized when detached (see terminology below). There are no chevrons; the pieces numbered IV (textfig. 2) are believed to be homologous.

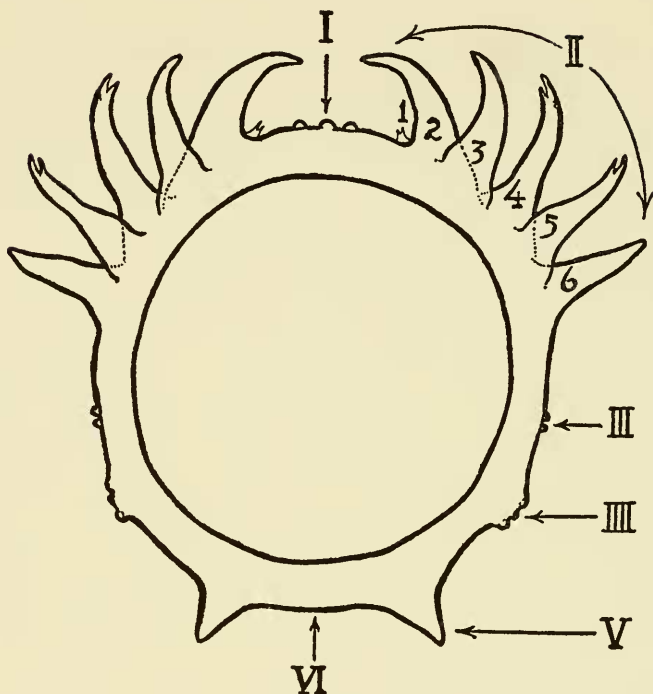
Anterior parapodia are uniramous and provided with only composite spinigerous setae in addition to single acicula. The middle body region is transitional, with notopodia weakly developed. A long, posterior region has well developed biramous parapodia in which both notopodia and neuropodia are noticeably larger than those in front. Notopodia are provided with single acicula and few simple setae; they are usually hooked at the tip and have a long, pointed hood. Neuropodial setae resemble those in front; they are much like those in species of *Goniada* (see above).

The organs of the proboscis in *Glycinde* are of special interest because of their remarkable diversity and striking patterns. The only extensive account of these parts, of which I am aware, that explains and illustrates the details and distribution of these processes, is that by Levinsen (1893, p. 332, pl. 1, figs. 1-6) based on *Glycinde nordmanni* (Malmgren). The complexity of their arrangement and the regularity of their occurrence is clearly indicated. However, there is an unfortunate confusion of terms and errors in orientation of dorsal for ventral parts throughout Levinsen's description and figures. Also, the distal para-

gnaths are designated jaws, whereas the proximal proboscicial organs are called paragnaths. The illustration of the terminal aperture, showing macrognaths and micrognaths, is likewise reversed, so that the ventral macrognaths are shown dorsal, and the dorsal arc of micrognaths is shown below. Levinsen's description of the arrangement of the parts, however, resembles that in other species of the genus. A translation follows.² "The ventral [dorsal] paragnaths form a fairly broad, longitudinal belt which is separated from the other by a narrow median space [area I, textfig. 2]. In this space one finds a row of extremely small pieces [proboscicial organs of area I]; each longitudinal band is again composed of series of transverse, or more correctly slightly slanting rows of belts of which each is composed of 5 [though actually 6 are shown] pieces with a formula 1.1.2.1. Commonly these paragnaths could be described as narrow, compressed bodies which are fastened by a broad, basal portion and raised freely from the upper surface of the proboscis. The innermost piece in each row [proboscicial organ II-2] is hooklike and resembles much a hook of a *Taenia*. The hook is directed diagonally backward. The next piece [II-3] has a diagonally cut-off point and on the outermost the point is forked. Between each 2 hooks in the same longitudinal row there lies yet a small narrow piece [II-1] The dorsal paragnaths [ventral proboscicial organs] are on each side separated from the ventral [dorsal] ones by a considerable space. They are tongue-shaped, fairly short pieces, arranged in 4 widely separated, single, longitudinal rows [includes proboscicial organs of areas IV and V]. The paragnaths in the 2 middle rows [V] are larger and more widely separated from each other than in the 2 outer [IV]." The details of the individual pieces are not shown. Thus, the pores which are almost certainly present in most of the organs are neither shown nor mentioned; the number of processes, if any, on proboscicial organ IV (see textfig. 2) is not disclosed. A more precise description of these organs is lacking for *G. nordmanni* (Malmgren).

These organs not only occupy well defined areas, but have characteristic shapes. They are here described in detail since they are found to be specific for all species investigated. For ready reference, the surface of the proboscis is divided into areas, numbered I to VI. These areas are most clearly distinguished in cross section of the proboscis (see textfig. 2). Area I is mid-dorsal; it may have one to several rows

² I am indebted to Mr. Anker Petersen of the Allan Hancock Foundation staff for a translation of this account from the Danish into English.



TEXTFIGURE 2

Glycinde armigera Moore, cross section from the middle of the proboscis, with areas I, II- 1 to 6, III, IIII, V and VI indicated, x 90.

of minute processes. Area II refers to the paired, dorsolateral bands; it has several rows of conspicuous sets of pieces, arranged in oblique series. In species where examined, it is possible to refer to these pieces individually, by numbering them from II-1 to II-6, since each piece is unique for the position it occupies. Area III refers to the paired, lateral rows numbering one to several on a side; they are of a single kind and usually small. Area IV refers to the paired, ventrolateral, one or 2 rows, and area V to the paired ventral rows, one on a side. Area VI marks the midventrum and is bare in the species that have been examined. Organs on area V may also be lacking in some species.

All proboscis organs except those on area IV have an apical or subapical (rarely basal) pore. Those on area IV are provided with hard, spinous processes and appear to function perhaps in the same manner as do the chevrons in species of *Goniada* (above). The organs with pores have one or more spinous processes, directed straight or obliquely back, toward the mouth when the proboscis is everted. Those

on area I (pl. 6, fig. 5) have the spine directed orally; those on area II (figs. 7 to 12) are directed obliquely back and mid-dorsally; those on area III have the spine directed ventrally (they have their long axis at right angles to that of the body). Those on area V have the spine directed obliquely orally and midventrally. The organs on area I are smallest but those on area V may be vestigial or absent. Those on area II are not only the largest, but have articulating bases.

The proboscidal organs of *Glycinde* that most nearly resemble the corresponding structures in *Goniada* are the smaller ones on area I (likened to the dispersed ones) and area IV (to the chevrons). In *Glycinde* most of the specialized structures appear to function for grasping and holding; those on area IV, however, may function to main stabilization of the long body with the greatly extensile proboscis. The enormous length of the latter in species of this genus is notable, and can be appreciated by observing that the eversible part includes not only that shown everted (fig. 1) but also the portion extending nearly to the left hand side of the drawing (where the paragnaths are located).

In so far as has been observed, the occurrence and the arrangement of these parts for different species of *Glycinde* are singularly alike, but the structural details of the separate pieces differ from one species to the next. Closer scrutiny of other species than those detailed herein, may reveal greater differences within the genus.

The known species of *Glycinde* are widely distributed and over half of them have been described from the Western Hemisphere. They are as follows:

G. armata (Kinberg), 1866, p. 247, from southern South America (see Monro, 1936, p. 143, for redescription).

G. armigera Moore, see p. 49.

G. bonhourei Gravier, 1906, pp. 142-145, from the Red Sea.

G. dorsalis Ehlers, 1905, pp. 38-40, from New Zealand.

This is further recorded by Augener (1924, p. 439) in which biramous parapodia occur from segment 38-40, and Augener (1927b, p. 351) in which they occur from segment 30, with the third body region from segment 54-55. So great a variation is hardly to be expected within a single geographic area (Australia).

G. kameruniana Augener, 1918, pp. 398-399, from West Africa.

According to its author, this species is incompletely known.

G. multident Müller, see p. 56.

G. nordmanni (Malmgren), 1866, p. 409, from western Europe (see Fauvel, 1923, p. 394, fig. 155, for description).

G. oligodon Southern, 1921, pp. 629-632, from Chilka Lake, India.
G. pacifica Monro, 1928, pp. 83-85, from Taboga, Panama (see Monro, 1936, p. 144, for further description).

G. picta Berkeley, 1927, p. 412, from western Canada and Alaska (see Hartman, 1948a, p. 29, for review).

G. polygnatha, new species, see p. 51.

G. solitaria (Webster), revised, see p. 54.

G. trifida (McIntosh), 1885, pp. 341-342, from subantarctic regions (see Augener, 1924, p. 440, for possible identity with *G. dorsalis* Ehlers).

G. wireni Arwidsson, 1899, pp. 53-54, from the Bering Sea.

In addition, *G. longepapillata* Voit (1911, pp. 114-116) from the North Sea, is possibly *G. nordmanni* (Malmgren); *G. maskaliensis* Gravier is here referred to *Goniadopsis* Fauvel (see above).

KEY TO SPECIES OF *Glycinde*

1. Presetal lobe in far posterior neuropodia bifurcated 2
1. Presetal lobe in posterior neuropodia entire 3
2. Micrognaths of proboscis number 15 to 20; parapodial change at about segment 30 to 35 *G. armata*, p. 47
2. Micrognaths of proboscis number 6 dorsal and 6 ventral; parapodial change at about segment 40 to 42 (but see above) *G. dorsalis*, p. 47
3. Prostomium lacks annulations and eyes; anterior region with 20-25 segments *G. pacifica*, p. 57
3. Prostomium with annulations and eyes; anterior region usually with more segments 4
4. Dorsal cirrus incised near tip (pl. 7, fig. 14) 5
4. Dorsal cirrus not incised near tip 7
5. Presetal lobe much longer than postsetal one in anterior segments *G. oligodon*, p. 54
5. Presetal and postsetal lobes subequal in anterior segments 6
6. Presetal lobes obcordate (pl. 8, fig. 2) *G. polygnatha*, p. 51
6. Presetal lobes triangular (pl. 7, fig. 15) *G. solitaria*, p. 54
7. Uniramous parapodia present through only about 20 segments *G. kameruniana*, p. 47
7. Uniramous parapodia present through 24 or more segments 8
8. Ventroposterior face of notopodia with a small papilla in median segments; uniramous parapodia through 25 or 26 segments *G. multidentis*, p. 56

8. Ventroposterior face of notopodia without a small papilla in median segments; uniramous parapodia usually more numerous 9
9. Anterior uniramous end consists of 36 or 37 segments; prostomium with 2 pairs of eyes *G. nordmanni*, p. 47
9. Anterior uniramous end consists of 31 or fewer segments; eyes variable 10
10. Some presetal lobes obcordate 11
10. Presetal lobes triangular *G. wireni*, p. 48
11. Presetal lobes markedly obcordate *G. armigera*, p. 49
11. Presetal lobes slightly obcordate *G. picta*, p. 48

Glycinde armigera Moore

Plate 6, figs. 1-12

Moore, 1911, pp. 307-311, pl. 21, figs. 160-161; Berkeley, 1927, p. 411; Berkeley, 1941, p. 34; Berkeley, 1942, p. 194; Hartman, 1944c, p. 255.

Goniada annulata Treadwell, 1914, p. 198 (in part).

G. multident Hartman, 1940, pp. 249-251, pl. 44, figs. 126-131. *Not Müller*, 1858.

Collections.—174-34 (1); 851-38 (1); 893-38 (1); 909-38 (1); 913-39 (1); 915-39 (1); 985-39 (1); 990-39 (1); 998-39 (1); 1008-39 (1); 1030-40 (1); 1132-40 (3); 1137-40 (3); 1138-40 (1); 1160-40 (3); 1178-40 (1); 1182-40 (1); 1191-40 (5); 1192-40 (1); 1194-40 (1); 1195-40 (1); 1197-40 (5); 1219-40 (1); 1220-40 (4); 1223-41 (3); 1229-41 (6); 1237-41 (1); 1253-41 (2); 1259-41 (1); 1260-41 (1); 1264-41 (1); 1267-41 (2); 1268-41 (2); 1274-41 (4); 1275-41 (3); 1289-41 (4); 1313-41 (2); 1316-41 (1); 1318-41 (2); 1321-41 (4); 1340-41 (1); 1373-41 (1); 1384-41 (1); 1387-41 (2); 1388-41 (3); 1390-41 (3); 1392-41 (1); 1396-41 (4); 1402-41 (5); 1411-41 (1); 1412-41 (1); 1413-41 (1); 1424-41 (1); 1425-41 (1); 1435-41 (2); 1436-41 (1); 1444-42 (1); 1471-42 (2); 1472-42 (4); 1497-42 (1). Many other individuals, not separately listed, come from southern California, north to Washington.

The anterior uniramous region consists of 27 to 30 segments; the median region is transitional, with notopodia gradually enlarging through 47 or more segments, and extending back to about segment 70 to 78. Posterior parapodia are broader than those in front and distinctly biramous.

The prostomium has 9 (or only 8) distinct rings. A pair of eyes is clearly visible on the basal ring, or it may be deeply embedded and obscure. A second pair is visible in the distal ring, especially in juvenile or translucent individuals, but less clear in opaque or older specimens. The proboscis has a circlet of 18 terminal papillae and dark paragnaths. The paired macrognaths are ventral in position and have 3 or 4 large teeth each, the largest on the dorsal end. Micrognaths consist of a dorsal arc of about 30 pieces, in a double row. There are no ventral micrognaths.

The proboscis length, when everted, appears closely annulated because of the regular arrangement of the attached organs (fig. 1). They form successive circlets, each with processes in similar arrangement. Starting at the middorsum and progressing to the midventrum (textfig. 2), area I (middorsal) has 2 or 3 processes, II has 6, III has 1 or 2, IV has 2, V has one and area VI (midventral) lacks processes. The organs on area II are largest and most conspicuous; those on area I are smallest. The latter are of a single kind, arranged in 2 or 3 irregular rows; each has a thick base, a distal pore and a sharp spine (fig. 5) directed orally. Those of area II are of 6 kinds, numbered 1 to 6; those on II-1 are smallest, those on II-2 are largest. Pieces on II-1 are long, slender, falcate, distally bidentate (fig. 7) or rarely tridentate. Those of II-2 are strongly falcate, distally entire (fig. 8). Those of II-3 are similar to the preceding but less falcate (fig. 9); those of II-4 (fig. 10) and II-5 (fig. 11) are long, erect, the tip distinctly bifid; those of II-6 (fig. 12) are also tall and erect, with bifid tip and excavate base. All organs shown for area II are taken from the same series and were drawn to the same scale.

Area III has one or 2 rows of low, papillar processes with a sharp spine (fig. 6) directed ventrally; they are transversely elongated. Area IV has 2 knobbed processes on each side; they lack a pore. Each consists of a short, broad base that terminates distally in 4 short bosses (figs. 2, 3) in symmetrical arrangement; the bosses are directed away from the center of the proboscis. Area V, on each side, has a single, hard, triangular piece with spine (fig. 4) directed obliquely midventrally and orally; the pore is subapical, on the outer side; seen from the front, these processes appear short and triangular.

Some interesting variations are noteworthy. An individual from intertidal zones in the Puget Sound, Washington, area differs from typical specimens from California as follows: The embedded portions of the proboscis organs on area II-2 are greatly prolonged such that

this portion exceeds in length the free, erect part. The other pieces on area II are similarly prolonged in their basal parts but in diminishing degree. Another individual from Clarion Island, Galapagos (station 915-38) differs from typical ones in having these bases proportionately shorter.

Presetal, neuropodial lobes are distinctly obcordate in anterior and median segments; after segment 100 they come to be merely triangular. This obcordate condition is also less marked in juvenile, than in adult individuals; it may not be reliable for specific identification.

Earlier *G. armigera* (Hartman, 1940, pp. 250-251) was questionably referred to *G. multident* Müller. For reasons detailed below they are here regarded distinct, although the latter remains very poorly known, rendering clear separation difficult.

Distribution.—*G. armigera* Moore is abundant off southern California; it is widely distributed in the Eastern Pacific from British Columbia (Berkeley, 1942) south at least to Central America, and west to the Galapagos Islands; it ranges from low intertidal zones to 275 fms.

***Glycinde polygnatha*, new species**

Plate 8, figs. 1-9, plate 9, figs. 1-9

Collections.—San Francisco Bay and outside Golden Gate, California, at the following stations of the U.S.S. *Albatross*, collected January 1912 to January 1913, in 4 feet to 68 fathoms (consult dredging and hydrographic records of the U.S. Fisheries Steamer *Albatross*, 1911-1920. Appendix III to the Report of the U.S. Commissioner of Fisheries for 1920, Bureau of Fisheries Document no. 898, Washington, 1911, for more complete data). D 5709 (1); D 5714 (9); D 5719 (6); D 5722 (10); D 5724 (1); D 5727 (3); D 5729 (6); D 5744 (1); D 5746 (1); D 5747 (8); D 5763 (12); D 5771 (2); D 5775 (1); D 5788 (1); D 5790 (1); D 5804 (1); D 5810 A (2); D 5830 (1). Other collections come from Drakes Estero (1), Tomales Bay (6), Dillon Beach (1), all in Marin County, California; Bodega Lagoon, Sonoma County, California (3); Coos and Yaquina Bays, Oregon, shore to 2-5 fms, collected by Fred Ziesenhenné (2); Brown Island, near Friday Harbor, Washington, in muddy sand, collected by Professor G. E. MacGinitie (1); Lazy Bay, off Alitak Bay, Alaska, in sand and gravel at low tide, collected by the Alaska King Crab Investigation Committee (see Hartman, 1948a) (3).

Total length attains 50 to 61 mm; number of segments reaches 150 to 175. There is no distinct color pattern (preserved) but the dorsum and dorsal cirri are diffused with light brown and the rest of the body is yellowish brown. The anterior, uniramous portion extends through 26 or 27 segments; a small, inconspicuous notopodium marks the beginning of the transition zone; the notopodium increases gradually in size.

The prostomium has the usual form; it consists of 8 or 9 rings; the basal one is the longest. The 4 terminal antennae are small and subequal in length to one another; they have clavate bases and minute, distal articles. Eyes include one pair in the fleshy tissue of the basal ring and a second pair in the distal ring.

The proboscis terminates distally in 16 soft papillae. Within this circlet there are 2 heavy, dark brown, dorsolateral macrognaths, each with 4 or 5 distal teeth, increasing in size laterally. Micrognaths consist of a dorsal arc of about 20 pieces and a short, ventral arc of 3, or 5 or only 2 quadricuspidate pieces; they are sometimes difficult to distinguish.

Proboscoidal organs are conspicuous throughout the length of the proboscis except at the base, where the peristomial membrane is continuous. Those on the dorsal side are largest. All except those on area IV have a distal pore. Those on area I are in 3 or 4 irregular rows and all resemble one another; they are small and semioval; each has a large, hard spine at the tip, directed orally (pl. 9, fig. 7). Those on area II consist of 6 kinds, numbered II-1 to II-6, beginning medially and extending laterally. Those of II-1 are median and smallest; they are distally entire (fig. 1) or weakly bifid. Those of II-2 (fig. 2) and II-3 (fig. 3) are large, strong and falcate; they have an entire tip and a sub-apical pore. Those of II-4 (fig. 4), 5 (fig. 5) and 6 (fig. 6) are progressively smaller and have a tip that is entire or weakly bifid; the last are especially notable for having a broad, embedded base. Proboscoidal organs on area III consist of 5 or 6 longitudinal rows of a single kind (fig. 8); they are long in the transverse axis and have a heavy spine directed ventrally. Those of area IV are disposed in 2 rows on each side; each is provided with 4 distal bosses (fig. 9) of which 3 are much taller and stronger than the fourth; these organs are of further interest in that they increase considerably in size as one approaches the base of the proboscis, especially those of the inner row, so that the 2 of a series may be very unequal in size. Organs on area V are inconspicuous or absent; area VI is also bare.

The first parapodia are the smallest and succeeding ones increase in size gradually. The first one has equally long, triangular dorsal and ventral cirri and a presetal lobe; the postsetal lobe is not developed. The second parapodium resembles the first but is larger. The third one is still larger and has a short postsetal lobe. From the fourth, the postsetal lobe is long, equalling the length of its respective presetal lobe; its dorsal and ventral cirri are larger. Already from the first, the dorsal cirri tend to be slightly incised near the tip, at the lower edge; this character develops noticeably farther back (pl. 8). At segment 26 or 27 a small notopodium makes its appearance, near the base of the dorsal cirrus; it is provided with 3 to 5 simple setae. Farther back the notopodium comes to have a small, presetal, auricular lobe (figs. 2, 3) which may be considered homologous to the presetal lobe of neuropodia. The acicular lobe is blunt and about as long as the larger, slightly ventral postsetal lobe.

Neuropodia are much longer and larger than the corresponding notopodia; the presetal portion is distinctly obcordate (fig. 2) and continues so throughout the body, after the first few segments. At first the presetal lobe is shorter than the triangular, postsetal one, but in the posterior half of the body the former is the longer. Dorsal and ventral cirri are broad, triangular and proportionately longer in anterior segments. The dorsal cirrus is incised near the tip.

Setae and acicula are yellow. Notoetae include 3 to 5 simple, hooded hooks in each notopodium. Each hook has a strong, cylindrical shaft and ends distally in a slightly recurved, transversely ridged beak that is covered distally by a long, pointed, hyaline hood which is delicately toothed at its free edges (figs. 4, 5). The hood is continuous with the shaft and gradually merges with it. Notoacicula occur singly in notopodia; they are heavy rods that taper distally to a blunt point; they are usually completely embedded, or the tip may be slightly projecting.

Neurosetae occur in full, fan-shaped fascicles, supra- and subacicular in position. All are of a single kind but the length of the shaft and appendage varies, the longest occurring in the middle of the fascicles. Neuroacicula occur singly and resemble the corresponding notoacicula except that they are slightly the heavier. Neurosetae have an articulation that is delicately serrated at the outer or long end (figs. 6, 7 and 8). The appendage is long, tapering and has 4 or 5 transverse rows of short teeth (at maximum development). In cross section (fig. 9) it is seen to be widest at the outer or cutting edge. The articulation is seldom seen in lateral view because of the mechanical structure of the blade and juncture (see above).

G. polygnatha resembles *G. solitaria* (see below) and *G. oligodon* Southern in having dorsal cirri that are incised near the tip; they are distinguishable from one another as indicated in the key (above). *G. polygnatha* grossly resembles *G. armigera* Moore but the first is usually the larger. Proboscoidal organs also differ (compare plates 6 and 9); the organs on area V are conspicuous in *G. armigera* and rudimentary or absent in *G. polygnatha*. Micrognaths in the ventral arc are typically present in *G. polygnatha* and absent from *G. armigera* Moore.

Holotype and paratypes in the Allan Hancock Foundation.

Type locality.—San Francisco Bay, California.

Distribution.—Alaska south through Washington, Oregon and California, south to San Francisco Bay; intertidal in sandy mud flats and in shallow depths to 68 fms.

***Glycinde solitaria* (Webster), revised**

Plate 7, figs. 1-15

Goniada solitaria Webster, 1879, p. 117; Webster, 1886, p. 146, pl. 7, figs. 41, 42, pl. 8, figs. 43, 44; Cowles, 1931, p. 341.
Hartman, 1945, p. 23.

Collections.—Beaufort, North Carolina, from sandy shoal at low tide line (1); Chesapeake Bay, Maryland (2).

This is a small species; length of an ovigerous individual (preserved) is only 20 mm complete. It consists of 101 segments of which the first 24 are uniramous, the others gradually biramous.

The prostomium consists of 9 rings of which the basal one is much the largest and longest. The 2 distalmost rings are incompletely separated from each other, but the others are clearly marked. A conspicuous pair of eyespots is visible dorsally, in the basal ring and there is a pair of smaller ones in the distal ring, visible in ventrolateral view. The 4 distal antennae are small, subequal, slender, biarticulate and each has a minute distal article.

The proboscis (seen only by dissection) is covered with heterogeneous organs as typical of the genus *Glycinde*. The distal end terminates in a circlet of soft papillae. The paired ventral macrognaths are large; each has 5 teeth that are largest on the dorsal end. Micrognaths consist of a dorsal arc of about 10 pieces; there are no ventral micrognaths.

Proboscoidal organs occur on areas I to V. Those of area I consist of a single, longitudinal row of small, semiglobular pieces with an apical pore and a sharp spine directed orally; there is a low boss on the side opposite the spine, near the margin of the pore. Area II has 6 sets of

organs, numbered II-1 to II-6 (pl. 7). Those on II-1 are short, with blunt tip and subapical pore (fig. 1). Those on 2 are large, sharply falcate, with entire tip and subapical pore (fig. 2). Those on II-3 are similar to those on 2, but less falcate (fig. 3). Those on II-4 and 5 are erect, with a large lateral tooth (figs. 4, 5) and a pore near the tip. Those on II-6 are slender, erect, distally entire and with a distal pore (fig. 6). All those shown on plate 7 were taken from the same series and drawn to the same scale. The organs on area III occur in a single, longitudinal row; they are low, broad processes, their long axis at right angles to that of the body and their single, large spine directed ventrally; they resemble those shown for other species of *Glycinde*. Area IV is provided with 2 rows of knobbed organs (figs. 8, 9); they lack a pore; each has 3 short processes and a much larger one near the center. Area V has a single row of long, triangular pieces that are distally bifid and each has a pore near the base, on the medial side (fig. 7).

Parapodia are well developed and are directed laterally. Notopodia are small and inconspicuous; they are first present from segment 25 and gradually increase in size going back. In anterior, uniramous segments both dorsal and ventral cirri are large (fig. 14). Here both presetal and postsetal lobes are about equally long or the presetal one is slightly the longer. These parapodia are provided with single yellow acicula and about 31 spinigerous, composite setae; they are arranged in a fan-shaped fascicle. The dorsal cirrus is incised near its tip, much as in *G. polygnatha* (see above).

In biramous parapodia both dorsal and ventral cirri decrease in size but the first continues to have a slight incision subdistally. Notopodia are armed with single, heavy acicula and few (3 or 4) acicular hooks that are distally falcate and provided with a long, slender hood, as typical for most species of the genus. Posterior neuropodia come to be larger and longer than those in anterior segments. The presetal lobe is long and far surpasses the postsetal one but it is never chordate in outline. The ventral cirrus is short and directed ventrally. Neurosetae include about 6 supra-acicular, and 7 subacicular composite spinigerous ones. Neuroacicula occur singly; they are pale yellow and slightly thicker than notoacicula.

The composite, spinigerous setae have the spinelets extensively distributed along the appendage. The shaft is long and cylindrical; at its distal end it widens to accommodate the basal end of the appendage. The distal end of the articulation is sharply dentate at its long, or outer edge; it has about 8 teeth (figs. 12, 13) and the sides slope gradually to the smooth concavity in back. The appendage, at its greatest development is

triangular in cross section; it has transverse rows of sharp spinelets (figs. 11, 13) that extend across the width of the appendage fig. 12).

G. solitaria has remained incompletely known and enigmatical so that comparison with other species of the genus was difficult. The type collection on which the original description was based, is not known to exist. The species was originally briefly described as a *Goniada*; Arwidsson (1899, p. 49) correctly surmised it to be a *Glycinde*, but erroneously referred *Goniadella gracilis* (see above) to it. The first 25 segments were described as uniramous (24 segments by my count). The setal lobes were described as "anterior long and narrow, posterior short and broad." The setae were said to be of only one kind; this referred probably to the composite, neuropodial setae; I assume that the acicular notosetae were designated acicula.

G. solitaria may be characterized thus: The parapodial change occurs at segment 25; the prostomium is 9-annulate and has 2 pairs of eyes; paragnaths consist of a pair of ventral macrognaths and a dorsal arc of about 10 micrognaths; a ventral arc is lacking. Proboscoidal organs of areas IV and V are unique. Anterior parapodia have larger dorsal and ventral cirri and subequal long setal lobes; posterior parapodia have smaller dorsal and ventral cirri and the presetal neuropodial lobe is much longer than its corresponding postsetal one. Dorsal cirri are incised near the tip.

Distribution.—*G. solitaria* (Webster) was originally described from New Jersey, at low water line. The present materials come from Chesapeake Bay, Maryland and Beaufort, North Carolina, from sandy shoals at low tide line.

Glycinde multidentis Müller

Müller, 1858, p. 214, figs. 4-6; Augener, 1918, p. 398.

This species is the type of the genus *Glycinde*, but it remains very poorly known in several important respects. It originates in Brazil. Augener (1918, pp. 398-399, pl. 7, fig. 196) reexamined the type collection and enhanced its description, but the structure of parapodial lobes and proboscoidal parts still remains obscure.

According to the revision, *G. multidentis* has anterior parapodia in which postsetal lobes are up to twice as long as the presetal ones. In biramous parapodia the postsetal lobe is at first longer than the presetal one, but farther back both lobes are about equally long; here each consists of a broad base that terminates in a point. In median, transitional parapodia there is a small notopodial papilla that is said to be ventro-posterior in position.

G. armigera Moore (see above) differs from *G. multidentis* in that notopodia have a small, auricular lobe that is presetal, not postsetal, in position. Presetal and postsetal lobes are not similar to each other, nor do the postsetal lobes terminate in an attenuate tip. Instead, the presetal lobe is strongly obcordate in anterior parapodia, and the postsetal lobe is obliquely truncate.

G. pacifica Monroe (1928, p. 83) has been thought identical with *G. armigera* Moore (Monroe, 1936, p. 144). Both have obcordate presetal lobes; in biramous parapodia there is a dissimilarity of the 2 lobes, as also in uniramous parapodia. Notopodia likewise have a small, short, presetal lobe. However, in *G. pacifica* the prostomium is said to lack annulations and eyes, and the change from uniramous to biramous parapodia is said to be already at segment 20 to 25. *G. armigera* has an annulated prostomium and 4 eyes; the parapodial change occurs at about segment 29 or 30. The length of *G. pacifica* (measured on sexually mature female) is only 35 mm, the width 1 mm; *G. armigera* is about 120 mm long and much wider; the latter often has a dark brown spot in segmental furrows, along the midventral line. It seems that both these species are not to be regarded as the same as *G. multidentis* Müller, in spite of the uncertainty regarding the last species.

Family **Glyceridae** Malmgren, 1867

=*Glycera* Grube, 1850, in part; =*Proboscidea* Blainville, 1825

The GLYCERIDAE are known for many species in few genera. *Glycera* Savigny (1818) (see below) is by far the largest genus; its species are widely distributed in all seas, and occur in intertidal to abyssal depths. *Hemipodus* Quatrefages (1866) (see below) is known through few species, all from the Pacific. *Glycerella* Arwidsson (1899) (see below) is known for a single species from abyssal zones. In addition, *Euglycera* Verrill (1881) has already been referred to *Glycera* (see *G. dibranchiata*, below) and *Rhynchobolus* Claparède, 1868, is long regarded congeneric with *Glycera* Savigny. *Hamiglycera* Ehlers, 1908, with type *H. serrulifera* Ehlers (1908, p. 105) goes to *Glycera lapidum* Quatrefages (see Augener, 1931, p. 304). *Telake* Chamberlin, 1919, known for the single species, *T. epipolasis* Chamberlin (1919a, p. 345) was based on a posteriorly incomplete, pelagic individual, only 23 mm long for 67 segments. The first part of the description (loc. cit., p. 345) names it an epitokous female, the later part calls it a male. The proboscis was withdrawn and its details were not described. *Telake* was separated from *Glycera* for supposedly lacking composite setae in pos-

terior segments. However, the illustrations (Chamberlin, pl. 63, figs. 4, 5) show parapodia in anterior and posterior regions that differ only slightly. It seems likely that the setae in posterior segments were withdrawn into the parapodium so that articulations were not visible without dissection. The bilobed, presetal and postsetal neuropodial lobes of this species recall those of *Glycera tessellata* Grube, with which the species seems to have its nearest affinities.

KEY TO GENERA OF GLYCERIDAE

1. Parapodia uniramous throughout, provided with only composite setae *Hemipodus*, p. 79
1. Parapodia biramous, with simple setae in notopodia and composite setae in neuropodia 2
2. Prostomium long, with more than 3 rings; aileron of jaws with a lateral wing (pl. 11, fig. 4) *Glycera*, p. 58
2. Prostomium short, with about 3 rings; aileron of jaws a simple rod *Glycerella*, p. 79

Genus *Glycera* Savigny, 1818

Type *G. unicornis* Savigny

This includes *Euglycera* Verrill, 1881, *Rhynchobolus* Claparède, 1868, *Hamiglycera* Ehlers, 1908 and *Telake* Chamberlin, 1919.

This genus comprises about 39 valid species (see list, below) but it has had over a hundred specific names attributed to it during the course of its history. Some species remain too poorly known to be distinguished. Others are known only from isolated geographic or ecologic regions so that their possible identity is sometimes difficult to surmise.

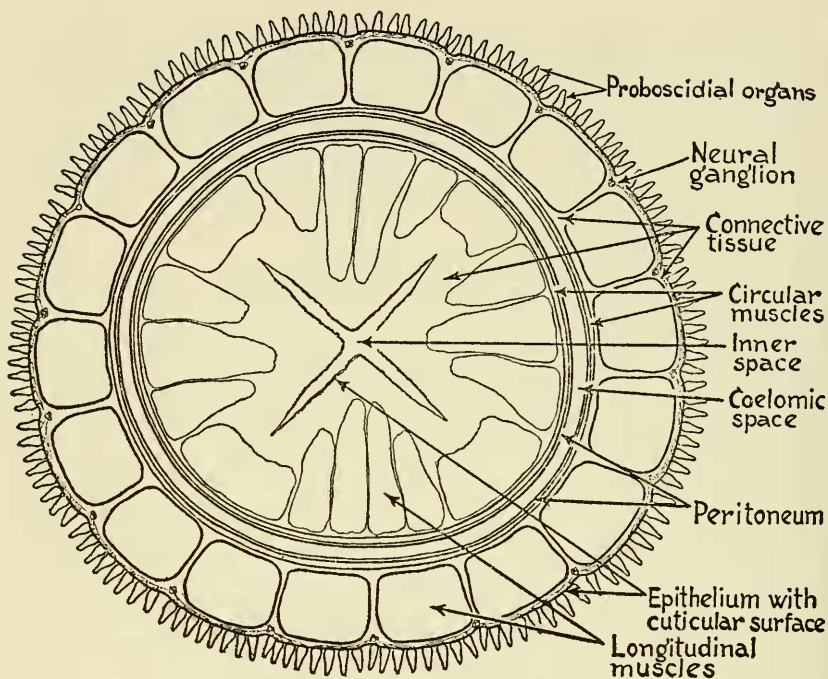
Separation into more clearly recognizable groups, such as subgenera, has long been desired. Arwidsson (1899) expressed it concretely and suggested a segregation, based however on characters that are difficult to distinguish. These were the presence or absence of epitoky, the relative extent of a proboscoidal membrane, and the presence or absence of anal processes. Other morphological features, not necessarily correlated with the presence or absence of these characters, may have as great, if not greater, phylogenetic significance.

The detailed structure of the fleshy parapodial lobes has been the most satisfactory index for the ready identification of most species of the genus, at least for geographic or regional reports. Unfortunately these lobes are subject to injury, or are variable within unpredictable degrees for species with wide distributional ranges; also, the extent of their development may have no real phylogenetic value. Another more

stable character, such as the structure of the setae, appears to be too uniform throughout the genus to have differential value. The form of the 4 large, horny paragnaths attached to the distal end of the proboscis is sometimes specific for the embedded aileron, but requires dissection to verify its nature. The kinds of parapodial branchiae, if present, are also useful but these organs are sometimes highly extensile or retractile, and may vary further with age of individuals, or be subject to environmental fluctuations.

Another feature that has been found to be highly specific in the species investigated, concerns the minute and numerous organs of the proboscis. These parts are discussed more fully below. The gross structures of the proboscis are well known but the functions of the various parts have been differently interpreted. Thus, the distal jaws or paragnaths have been generally regarded as organs for capture of food. The circlet of terminal papillae are usually regarded as sensory in function. There is uncertainty regarding the 4 large glands near the embedded paragnaths, but they have been named poison glands (Ehlers, 1868, p. 643). The very numerous proboscidial organs that more or less completely cover the epithelium have usually been called papillae, but since they are herein shown to have a terminal or subterminal pore, the term may be inapt. Both pore and canal have been observed, but their relations or significance have remained doubtful.

The successive layers of the proboscis, in cross section (textfig. 3) are most clearly demonstrated on the everted organ. The proboscis is then seen to consist of a double tube composed of outer and inner cylinders. They are separated from each other by the inner coelomic space. At the distal end they are connected to each other by the membranes that bound the paragnaths. At the proximal end they connect with the sheath that bounds the mouth on the outside and the proximal end of the alimentary tract on the inside. These inner and outer cylinders resemble each other except that the outer one is covered with proboscidial organs (called papillae by some authors) and the inner one is smooth. Each layer is overlain by a cuticular epithelium. This covers a layer of connective tissue penetrated by nerve ganglia and plexuses. The longitudinal muscles forming 18 bands (textfig. 3) are separated from one another by narrow strands of connective tissue. Within is a continuous cylinder of circular muscles and finally the peritoneal lining of the coelomic cavity. The layers of the inner cylinder are similar to those of the outer, but in reverse order (Oppenheimer, 1902).



TEXTFIGURE 3

Glycera oxycephala Ehlers, cross section of the proboscis at the distal third, showing the relation of the proboscical organs to underlying structures, x 70.

The proboscical organs of the external cylinder are in intimate contact with the surface and are penetrated by vacuolated tissues; the presence of muscular tissue within them seems likely but has not been proven. Each organ contains a few large cells, visible even in unstained tissue, in addition to many much smaller cells. The large cells are of 2 kinds; there are one or 2 larger basal cells and about as many smaller axial cells (see Oppenheimer, 1902, p. 558, for terminology). The basal cells are large, circular or oval and located at or near the base of the proboscical organ. The axial cells are smaller and spindle-shaped; they lie along the length of the organ and have neural connection with the nerve ganglion and plexus in the connective tissue, as also with a circlet of nerves at the distal end or about the aperture of the proboscical organ. It is likely that these axial cells aid in the control of the aperture at the distal pore. The function of the larger cells is not clear, but they may be expected to be secretory. The similarity of these organs in members of the GLYCEREA is striking, but there is much diversity of their external parts.

The relations of these 2 kinds of cells to their underlying structures, was described in detail by Oppenheimer (1902). Strangely enough the distal aperture of the organs was entirely overlooked. One must conclude that the technic employed for the preparation of the tissues (loc. cit., p. 555) was not favorable to disclose them. Oppenheimer concluded that the organs have no muscular tissue, although Ehlers (1868) had suggested such tissue because of the contractility of the organs. Oppenheimer was unable to assign a function either to the large basal cells, or to the cuticular external ridges. She thought (loc. cit., p. 559) that the basal cells were "indifferent subcuticular cells, functioning probably the same as cover cells of more complicated sensory organs." The interesting circlet of closely spaced ganglia at the distal end of the organ could also not be explained, since the distal aperture was not observed. Consequently, the function of the axial cells could not have been surmised. The outer cuticular ridges were referred to as "wrinkling," and their function was said to be unknown. Since these are actually symmetrically arranged ridges, they are possibly concerned with expansion and contraction of the organs.

The structure of the proboscidal organs is clearly seen if care is taken in proper orientation, especially since they are bilaterally symmetrical structures. On killed or fixed materials they are often collapsed, or their external membranes are distorted. Since they are 3-dimensional objects and very small, they are frequently seen under high magnifications only as successions of optical sections. Imperfect lighting and faulty optical equipment may enhance the chance for aberrant views, and oblique shadows may contribute other illusions. It is only after an examination of many organs in different views that their true dimensional relations can be verified. To illustrate, one need only point out for one species, *Glycera convoluta* (see below) these organs have been variously shown or described as oblique plates (Fauvel, 1932a), incised cones (Arwidsson, 1897), or terminating in 2 points (Ehlers, 1868), but never, to my knowledge, with a capelike membrane that surrounds the conical organ and with a distal aperture (pl. 10, figs. 5, 6). In addition, these organs have been illustrated for many species of *Glycera*, but the distal aperture and penetrating canal have not been shown. Moore (1911, p. 304) made an unusually accurate observation in showing an apical pore for *Glycera branchiopoda* Moore, and described the organs as "containing a few large sensory cells and a supporting framework." Oppenheimer's studies (1902) are also noteworthy in this respect.

The arrangement of the organs on the proboscideal sheath is fixed. The distal pore is subdistal and directed away from the paragnathal end; the side with cuticular ridges (when these are present) is also abgnathal.

Up to now the fundamental kinds of these organs have not been used to effect a major grouping of the many species in the genus *Glycera*, although Arwidsson (1899, p. 22) allied certain species with *G. convoluta* Keferstein. Based on the materials examined, the species may be recognized for 4 groups.

In one group of species, the proboscideal organs are transversely ridged on one side (pl. 10, fig. 1). The following species are of this kind: *G. dibranchiata* Ehlers, *G. oxycephala* Ehlers, *G. robusta* Ehlers, *G. lapidum* Quatrefages, *G. tenuis* Hartman, and perhaps also *G. chirori* Izuka.

In another group of species, the proboscideal organs have an enveloping sheath or membrane (pl. 10, fig. 6). The following species are of this kind: *G. africana* Arwidsson, *G. alba* (Rathke), *G. cirrata* Fauvel (not Grube), *G. convoluta* Keferstein, *G. manorae* Fauvel, *G. onomichiensis* Izuka, *G. prashadi* Fauvel and *G. tridactyla* Schmarda.

In a third group of species the proboscideal organs are tall, slender and supported by strong, chitinized strands (pl. 10, fig. 11). To it belong *G. tessellata* Grube, *G. papillosa* Grube, possibly also *G. amboinensis* McIntosh and *G. longipinnis* Grube.

In a fourth group of species, all the organs are soft and oval, elongate or subspherical in shape; they lack visible surface ornamentation. The following species are believed to belong here: *G. americana* Leidy, *G. branchiopoda* Moore, *G. capitata* Oersted, *G. edwardsi* Gravier, *G. gigantea* Quatrefages, *G. guinensis*, Augener, *G. kerguelensis* McIntosh, *G. lancadivae* Schmarda, *G. rouxii* Audouin and Edwards, *G. subaenea* Grube and *G. unicornis* Savigny.

Species of *Glycera* are widely distributed in littoral regions. About 23 species are recorded from the Western Hemisphere. Six (or 7) are known from both Atlantic and Pacific shores, including *G. alba*, *G. americana*, *G. capitata*, *G. dibranchiata*, *G. oxycephala*, *G. tessellata* and possibly *G. robusta*. Eighteen species have been recorded from the Pacific side of the Americas; in addition to those mentioned above, they are *G. branchiopoda*, *G. carnea*, *G. convoluta*, *G. fundicola*, *G. gigantea*, *G. lancadivae* (but see list below), *G. longissima*, *G. martenseni*, *G. mexicana*, *G. papillosa*, *G. rouxii* and *G. tenuis*. The following species are recorded only from the Atlantic shores of America: *G. canadensis*,

G. incerta, *G. lapidum*, *G. longipinnis* and *G. sphyrabrancha*. More complete data for these names are given in the list on the following pages.

The list of specific names in *Glycera* is considerable; 110 are named below; some have been referred to synonymy, some others are questionable and a few may be regarded as homonyms. The following summary includes the original names that have been used. An original citation or a revised description is indicated, unless discussed below. The 41 names in *italics* type are those considered to be valid species.

G. abbranchiata Treadwell, 1902, p. 200, from Puerto Rico, is *G. tessellata* Grube, see Augener, 1922b, p. 205.

G. africana Arwidsson, 1899, p. 21, from west Africa, is possibly *G. convoluta* Keferstein, see Monro, 1930, p. 117.

G. alba (Müller) 1788, p. 29, from Europe and America, see Fauvel, 1923, p. 385.

G. alba cochiniensis Southern, 1921, p. 627, from India.

G. alba macrobranchia Moore, 1911, p. 301, from southern California, is *G. convoluta* Keferstein, see Hartman, 1940, p. 247.

G. albicans Quatrefages, 1866, p. 186, from France, is *G. alba* Rathke, see Fauvel, 1923, p. 385.

G. amboinensis McIntosh, 1885, p. 346, from Amboina.

G. americana Leidy, see p. 73.

G. basibranchia Chamberlin, 1919b, p. 14, is *G. convoluta*, see p. 73.

G. branchialis Quatrefages, 1866, p. 182, from France, is *G. alba* Rathke, see Fauvel, 1923, p. 385.

G. branchiopoda Moore, 1911, p. 302, from California and western Mexico.

G. brevicirris Grube, 1870, p. 61, unknown locality, is questionable.

G. canadensis (Treadwell), new combination.

This was erected as *Hemipodia canadensis* Treadwell, 1937a, pp. 348-349, figs. 1-3, from Halifax Harbor, Nova Scotia, Canada. It has both simple and composite setae, thus goes to *Glycera*. In so far as the description goes, it might be referred to *Glycera capitata* Oersted.

G. capitata Oersted, see p. 76.

G. capitata benguellana Augener, 1931, p. 303, from south Africa.

G. carnea Blanchard, 1849, p. 28, from Chile, is questionable.

G. chilensis Arwidsson, 1899, p. 24, from Chile, is *G. longissima* Arwidsson, see Moore, 1911, p. 304.

G. chirori Izuka, 1912, p. 245, from Japan and China, see Monro, 1934, p. 365.

- G. cinnamonea* Grube, 1874, p. 327, from Ceylon, is questionable.
- G. cirrata* Grube, 1856, p. 176, from Brazil, is *G. americana* Leidy, see Augener, 1934, p. 143.
- G. cirrata* Fauvel, 1932a, p. 129, from India, *not* Grube, 1856. This has proboscoidal organs with a capelike sheath, as in *G. convoluta* Keferstein, and is not the same as *G. cirrata* Grube.
- G. convoluta* Keferstein, see p. 72.
- G. convoluta capensis* Monro, 1933b, p. 499, from south Africa.
- G. convoluta uncinata* Rioja, 1918, p. 85, from Europe, is *G. convoluta* Keferstein, see Fauvel, 1923, p. 383.
- G. corrugata* Baird, 1863, p. 109, from Vancouver Island, Canada, is *G. americana* Leidy, see p. 73.
- G. danica* Quatrefages, 1866, p. 187, from Denmark, is *G. alba* Rathke, see Ehlers, 1868, p. 660.
- G. decipiens* Marenzeller, 1879, p. 140, from Japan, is *G. rouxii* Audouin and Edwards, see Fauvel, 1932a, p. 128.
- G. decorata* Quatrefages, 1866, p. 181, from France, is *G. gigantea* Quatrefages, see Fauvel, 1923, p. 388.
- G. dibranchiata* Ehlers, see p. 70.
- G. diodon* Schmarda, 1861, p. 94, from Chile, see *Hemipodus*, below.
- G. dubia* Blainville, 1825, p. 451, locality unknown, is indeterminable, see Fauvel, 1923, p. 391.
- G. edentata* Hansen, 1882, p. 17, from Brazil, is *G. americana* Leidy, see Augener, 1934, p. 143.
- G. edwardsi* Gravier, 1906, p. 139, from Red Sea.
- G. ehlersi* Arwidsson, 1899, p. 19, from the North Sea, is *G. gigantea* Quatrefages, see Fauvel, 1923, p. 388.
- G. epipolasis* (Chamberlin), new combination.
This was recorded as *Telake epipolasis* Chamberlin, 1919a, p. 345, from the Gilbert Islands, south Pacific, surface. The same name by Treadwell, 1941, p. 29, from Bermuda, surface, is perhaps a different species.
- G. exigua* Chamberlin, 1919b, p. 13, from southern California, is *G. convoluta* Keferstein, see Hartman, 1936, p. 32.
- G. fallax* Quatrefages, 1866, p. 184, from France, is *G. gigantea* Quatrefages, see Fauvel, 1923, p. 387.
- G. folliculosa* Ehlers, 1868, p. 658, from France, is *G. gigantea* Quatrefages, see Fauvel, 1923, p. 388.
- G. fundicola* Chamberlin, 1919a, p. 352, off Peru.
- G. fusiformis* Fischli, 1903, p. 113, from Dutch East Indies, is questionable.

- G. gigantea* Quatrefages, see p. 75.
- G. goesi* Malmgren, 1867, p. 184, from Sweden, is *G. rouxii* Audouin and Edwards, see Fauvel, 1923, p. 389.
- G. guinensis* Augener, 1918, p. 389, from west Africa.
- G. hasidatensis* Izuka, 1912, p. 246, from Japan, is *G. subaenea* Grube, see Fauvel, 1919a, p. 425.
- G. incerta* Hansen, 1882, p. 17, from Brazil, is questionable. Augener, 1934, p. 144, after examining the type, compared it with *G. tessellata* Grube, but the 2 are not the same, since the latter has a bifurcated aileron, the former a simple fang.
- G. jucunda* Kinberg, 1866, p. 245, from Brazil, is *G. americana* Leidy, see p. 73.
- G. kerguelensis* McIntosh, 1885, p. 344, from the Kerguelen Islands, is possibly *G. capitata* Oersted, see Benham, 1921, p. 74.
- G. koehleri* Roule, 1896, p. 451, from France, is questionably *G. tessellata* Grube, see Fauvel, 1923, p. 387.
- G. krausii* Stimpson, 1856, p. 392, from south Africa.
- G. laevis* Kinberg, 1866, p. 245, from Brazil, is *G. americana* Leidy, see p. 73.
- G. lamelliformis* McIntosh, 1885, p. 347, from New Zealand.
- G. lancadivae* Schmarda, 1861, p. 95, from Ceylon, see Fauvel, 1932a, p. 125.
- G. lancadivae* Berkeley, 1939, p. 334, from Guatemala, is perhaps *G. mexicana* Chamberlin, see Hartman, 1942c, p. 126.
- G. lapidum* Quatrefages, 1866, p. 187, from Europe, see Fauvel, 1923, p. 386. This is further recorded off Nova Scotia, Canada, in 1332 meters (Fauvel, 1932c, p. 23).
- G. longipinnis* Grube, 1878b, p. 182, from the Philippine Islands, see Fauvel, 1932a, p. 125. This is questionably recorded from the Caribbean Sea by Monro (1939, p. 347).
- G. longipinnis* Treadwell, 1914, p. 198, from southern California, is *G. convoluta* Keferstein, see p. 72.
- G. longissima* Arwidsson, 1899, p. 23, from southern South America. This is regarded the same as *G. americana* Leidy (Fauvel, 1919a, p. 425) but it differs somewhat, see Hartman, 1940, p. 245.
- G. macintoshi* Grube, 1877, p. 50, from China, is questionable.
- G. macrorhiza* Schmarda, 1861, p. 96, from Chile, see *Hemipodus*, below.
- G. manorae* Fauvel, 1932a, p. 130, from India.
- G. martensii* Grube, 1870, p. 60, from Chile, is questionable.
- G. mauritiana* Grube, 1870, p. 61, from Mauritius, is questionable.

- G. meckelii* Audouin and Edwards, 1834, p. 263, from Europe, is *G. unicornis* Savigny, see Fauvel, 1923, p. 389.
- G. mesnili* St. Joseph, 1898, p. 339, from France, is *G. unicornis* Savigny, see Fauvel, 1923, p. 389.
- G. mexicana* (Chamberlin), 1919a, p. 349, from the Gulf of California, see Hartman, 1942c, p. 126.
- G. micrognatha* Schmarda, 1861, p. 93, from Chile, see *Hemipodus*, below.
- G. minuta* (Bobretzky), 1870, p. 212, from the Black Sea, is questionable, but belongs to the *G. convoluta* group of species.
- G. misakiensis* Izuka, 1912, p. 242, from Japan.
- G. mitis* Johnston, 1865, p. 185, from Scotland, is *G. rouxii* Audouin and Edwards, see Fauvel, 1923, p. 389.
- G. monodon* Schmarda, 1861, p. 94, from Chile, see *Hemipodus*, below.
- G. mülleri* Quatrefages, 1866, p. 172, from Greenland, is *G. capitata* Oersted, see Arwidsson, 1899, p. 7.
- G. nana* Johnson, 1901, p. 411, from Washington, is *G. capitata* Oersted, see p. 76.
- G. nicobarica* Grube, 1868, p. 24, from Nicobar, is perhaps *G. krausii* Stimpson, see Ehlers, 1908, p. 103.
- G. nigripes* Johnston, 1865, p. 188, from Scotland, is questionable.
- G. onomichiensis* Izuka, 1912, p. 244, from Japan and China, see Okuda, 1938, p. 94.
- G. opisthobranchiata* Marenzeller, 1879, p. 139, from Japan.
- G. ovigera* Schmarda, 1861, p. 95, from New Zealand, see Ehlers, 1868, p. 643.
- G. oxycephala* Ehlers, see p. 70.
- G. pacifica* Kinberg, 1866, p. 245, from the Society Islands, see Hartman, 1948b, p. 100.
- G. papillosa* Grube, 1856, p. 176, from Chile, see Hartman, 1940, p. 248.
- G. peruviana* Quatrefages, 1866, p. 177, from Peru, is *G. americana* Leidy, see p. 73.
- G. polygona* Risso, 1826, p. 417, from Europe, is indeterminable, see Fauvel, 1923, p. 391.
- G. posterobranchia* Hoagland, 1920, p. 620, from the Philippine Islands.
- G. prashadi* Fauvel, 1932a, p. 126, from India and Japan, see Okuda, 1940, p. 16.
- G. profundus* Chamberlin, 1919a, p. 350, from western Mexico, is *G. branchiopoda* Moore, see Hartman, 1936, p. 32.

- G. retractilis* Quatrefages, 1866, p. 185, from unknown locality, is *G. gigantea* Quatrefages, see Fauvel, 1923, p. 387.
- G. robusta* Ehlers, see p. 69.
- G. rosea* Blainville, in Quatrefages, 1866, p. 194, from Chile, see *Hemipodus*, below.
- G. rouxii* Audouin and Edwards, 1834, p. 264, from cosmopolitan areas, see Hartman, 1940, p. 245.
- G. rugosa* Johnson, 1901, p. 409, from Washington, is *G. americana* Leidy, see p. 73.
- G. russa* Grube, 1870, p. 61, from Ovalau, south Pacific, is indeterminate.
- G. rutilans* Grube, in McIntosh, 1885, p. 345, from Ceylon. I find no evidence that a description was ever published; McIntosh gave no citation.
- G. saccibranchis* Grube, 1878b, p. 181, from the Philippine Islands, appears to be *G. subaenea* Grube, from the same locality.
- G. sagittariae* McIntosh, 1885, p. 346, from the south Pacific, is possibly *G. gigantea* Quatrefages, see p. 75.
- G. sagittariae* Treadwell, 1906, p. 1174, from Hawaii, is *G. tessellata* Grube, see p. 77.
- G. sagittariae* Fauvel, 1932a, p. 127, from India, is possibly *G. tessellata* Grube, see p. 77.
- G. septentrionalis* Roule, 1896, p. 452, from France, is questionably *G. gigantea* Quatrefages, or *G. tessellata* Grube, see Fauvel, 1923, p. 391.
- G. setosa* Oersted, 1843, p. 198, from Greenland, is *G. capitata* Oersted, see Arwidsson, 1899, p. 7.
- G. simplex* Grube, 1856, p. 176, from Chile and Peru, see *Hemipodus*, below.
- G. siphonostoma* (delle Chiaje), 1825, p. 413, from southern Europe, is questionable, see Fauvel, 1923, p. 388, although Augener, 1927c, p. 138, uses it in the sense of *G. gigantea* Quatrefages and Stolte, 1932, p. 421, in the sense of *G. unicornis* Savigny.
- G. spadix* Treadwell, 1943, p. 3, is *G. tessellata* Grube, see p. 77.
- G. sphyrabrancha* Schmarda, 1861, p. 96, from the West Indies, see Augener, 1925, p. 29.
- G. subaenea* Grube, 1878b, p. 184, from the Philippine Islands, see Fauvel, 1919, p. 425.
- G. taurica* Czerniawsky, 1881, p. 383, from the Black Sea, is questionable.
- G. tenuis* Hartman, see p. 71.

G. tessellata Grube, see p. 77.

G. tridactyla Schmarda, 1861, p. 97, from the Atlantic Ocean, is questionably *G. convoluta* Keferstein, see Fauvel, 1923, p. 383.

G. unicornis Savigny, 1818, p. 315, from Egypt, see Fauvel, 1923, p. 385.

G. verdescens Chamberlin, 1919b, p. 14, from southern California, is possibly *G. oxycephala* Ehlers, see p. 70.

G. viridescens Stimpson, 1853, p. 33, from Grand Manan, eastern Canada, is *Goniada maculata* Oersted, see Verrill, 1881, p. 289.

KEY TO SPECIES OF *Glycera*

1. Parapodia with 2 postsetal lobes 5
1. Parapodia with a single postsetal lobe 2
2. Proboscical organs with transverse ridges 3
2. Proboscical organs without ridges 4
3. Parapodia with 2 long presetal lobes in posterior segments; proboscical organs with 9 or 10 paired ridges (pl. 10, fig. 4) *G. oxycephala*, p. 70
3. Parapodia with a single presetal lobe in posterior segments; proboscical organs with 13 or 14 paired ridges (pl. 10, fig. 1) *G. tenuis*, p. 71
4. Proboscical aileron lacks a prolonged accessory process *G. capitata*, p. 76
4. Proboscical aileron with a prolonged process *G. papillosa*, p. 66
5. Without branchiae *G. tessellata*, p. 77
5. With branchiae 6
6. With nonretractile branchiae 7
6. With retractile branchiae 10
7. Parapodia with long, digitate, branchial lobes 8
7. Parapodia with blisterlike branchial processes . *G. robusta*, p. 69
8. Digitate branchial process at upper edge of parapodium 9
8. Digitate branchial process at both upper and lower edges of parapodium *G. dibranchiata*, p. 70
9. Branchial process longer than other parapodial lobes *G. convoluta*, p. 72
9. Branchial process not longer than other parapodial lobes *G. alba*, p. 63
10. Branchiae dendritically branched, emergent from posterior face of parapodia 11

10. Branchiae not dendritic; branchiae emergent from anterior or posterior face of parapodia 12
11. Postsetal lobes resemble presetal ones . . . *G. americana*, p. 73
11. Postsetal lobes shorter than presetal ones . . . *G. longissima*, p. 65
12. Branchiae are eversible subglobular vesicles from anterior face of parapodium *G. gigantea*, p. 75
12. Branchiae are eversible, digitately branched lobes from posterior face of parapodium 13
13. Proboscical organs much longer than wide . *G. subaenea*, p. 67
13. Proboscical organs not much longer than wide . *G. rouxii*, p. 67

***Glycera robusta* Ehlers**

Plate 10, figs. 7, 8

Hartman, 1940, p. 246 (synonymy); Berkeley, 1942, p. 193; Hartman, 1944c, p. 253.

G. longissima Hartman, 1940, p. 245. *Not* Arwidsson, 1899.

Collections.—903-38 (1); 1160-40 (1); 1267-41 (1); 1292-41 (1); 1417-41 (1); 1441-41 (2); 1442-41 (1); 1450-42 (3); 1451-42 (3); 1463-42 (2); 1468-42 (3); 1476-42 (2); 1477-42 (1); 1487-42 (1); 1488-42 (1); 1489-42 (1); 1490-42 (1); 1493-42 (2); 1494-42 (2); 1502-42 (1); 1505-43 (1); many others from Tomales and San Francisco Bays, south to southern California, shore to 20 fms; ?Lemon Bay, Florida (fragment).

The blisterlike branchiae on the dorsal edge of parapodia are characteristic, as are also the short, blunt, bifid parapodial lobes, but both of these features are less obvious on larger, presumably older individuals. The numerous proboscical organs nearly cover the proboscis. They are elongate, somewhat compressed and distally slightly curved (fig. 8). The oral side is ridged, crossed by 7 to 9 lines that meet in the middle or are somewhat alternate (fig. 7); a midrib is usually visible. The aperture is subdistal and sometimes wide open to considerably constricted. The large basal cell (or cells) is clear and has a dark, spherical mass, possibly nucleus. Individual organs are 76 micra in length, or shorter. Their number on the proboscis of a larger individual is estimated to be 60,000 to 75,000.

The single, incomplete individual from Anaheim Slough, California, reported as *G. longissima* (Hartman, 1940, p. 245) should be referred to this species.

Distribution.—*G. robusta* is known from Washington, south to southern California, shore to 52 fms, in gravelly sand. An incomplete individual from Lemon Bay, Florida, is questionably referred to this species.

Glycera dibranchiata Ehlers

Plate 10, figs. 9, 10

Hartman, 1940, p. 246 (synonymy); Rioja, 1941, pp. 708-709, pl. 1, fig. 7; Fauvel, 1943, pp. 16-17; Hartman, 1944b, p. 18; Hartman, 1945, p. 23.

Collections.—1030-40 (fragment); El Mogote near La Paz and San Lucas Cove, Lower California, shore, collected by E. F. Ricketts (2); Newport, Rhode Island, shore (3); Woods Hole and Vineyard Sound, Massachusetts, shore (2); Beaufort, North Carolina (16); Moss Beach, San Mateo County, California, shore (1).

This is chiefly characterized in its enlarged branchial lobes at dorsal and ventral ends of parapodia. The proboscoidal organs most nearly resemble those of *G. robusta* (see above) but the transverse ridges number only 5 or 6, instead of 7 to 9. Those of a pair meet medially and there is no distinct midrib (fig. 10). As in *G. robusta* Ehlers, the pore is subapical and on the side directed toward the mouth. The distal end is slightly curved (fig. 9).

Distribution.—*G. dibranchiata* Ehlers is reported from eastern shores of the United States from Massachusetts to North Carolina, also the West Indies and Caribbean Sea (Hartman, 1944b, p. 18). On the Pacific side its range extends from Mazatlan, Mexico (Rioja, 1941) northward at least to San Mateo County, California. It is intertidal to depths of 31 fms.

Glycera oxycephala Ehlers

Plate 10, figs. 3, 4, textfig. 3

Ehlers, 1887, p. 121; Hartman, 1940, pp. 248-249.

?*G. verdescens* Chamberlin, 1919b, p. 14.

Collections.—1205-40 (6); 1219-40 (1); 1232-41 (1); 1296-41 (2); 1330-41 (1); 1338-41 (1); 1340-41 (2); 1341-41 (1); 1342-41 (1); 1483-42 (3).

The body is usually long, slender and rather rigid except for a posterior coiled portion. Total length seldom attains 70 mm. A striking feature is the greatly attenuated and prolonged prostomium with its unequally long antennae. The bluntly rounded presetal lobes are also

diagnostic. The proboscoidal organs are unique in being tall and slender; their oral side is clearly ridged with 9 or 10 transverse ridges (fig. 4) and there is no apparent midrib. The distal end is slightly beaked (fig. 3) toward the oral aperture and there is a long canal leading to a large, clear cell with a tiny dark spot within.

Earlier, I (Hartman, 1940, p. 248) questionably referred to this species and now follow the same interpretation in designating the specimens enumerated above, even though Ehlers' (1887) original account is not clear on some points.

G. verdescens Chamberlin (1919b, p. 14) from Laguna Beach, California is here questionably referred to *G. oxycephala* Ehlers. The brief description, without illustrations, was based on a single, caudally incomplete individual, only 13 mm long for 69 segments, and was thus possibly a juvenile stage. A type specimen is not known to exist. The proboscis was not described. In so far as the description goes, it agrees with the specimens listed above in that the prostomium is similarly conical and slender; parapodial lobes appear to be the same, and its origin falls within the range of present materials.

Distribution.—*G. oxycephala* Ehlers is recorded from both sides of tropical America. Its range is here extended northward to California with its outlying islands, and Coos Bay, Oregon. Bathymetric range is subintertidal to 61 fms.

Glycera tenuis Hartman

Plate 10, figs. 1, 2

G. sp., juv.?, Treadwell, 1914, p. 198.

Hartman, 1944c, p. 254, pl. 21, figs. 23, 24.

Collections.—1496-42 (14).

The proboscoidal organs (figs. 1, 2) ally this species to *G. oxycephala* Ehlers. They are tall and slender, with 13 or 14 (rarely to 16) transverse ridges on the oral side, the 2 of a pair meeting medially. The distal aperture may be wide open (fig. 1) or considerably constricted. It leads internally to a long canal and a large cell near the base. The external ridges pass well around the sides so that in side view (fig. 2) they appear corrugated. In their tall, slender proportions they agree more nearly with what has been shown for *G. serrulifera* (Ehlers, 1908, pl. 14, fig. 16) than with those of any other species.

Glycera sp., ? juv., reported by Treadwell (1914, p. 198) from San Diego Bay, California, belongs here. The collection contains 2 individuals, taken from coarse yellow sand and broken shells in 2-3 fms; the specimens are now in the Allan Hancock Foundation.

Distribution.—*G. tenuis* is known from central California (Hartman, 1944c, p. 254), southern California and Coos Bay, Oregon; it occurs in intertidal to shallow depths.

Glycera convoluta Keferstein

Plate 10, figs. 5, 6

G. longipinnis Treadwell, 1914, p. 198. *Not* Grube, 1878b.
Hartman, 1940, p. 247.

Collections.—617-37 (1); 1441-41 (1); 1450-42 (2); 1451-42 (1); 1457-42 (1); 1505-43 (3); Mission Bay, California (1); Ensenada, Lower California, collected by E. F. Ricketts (1); Todos Santos, Lower California, collected by Thomas Burch (4); Monterey Bay, California, in 73 meters, collected by A. E. Galigher (1).

The proboscidal organs are of 2 kinds. The more numerous ones have a capelike sheath (figs. 5, 6); the others are larger and approximately oval in shape. The first are many more times as abundant as the second, but both are irregularly strewn, so as to cover the surface of the proboscis closely.

The sheathed organs have a unique structure that has been obscurely described and variously interpreted. Thus: "kurze kegelförmige Fortsätze, welche mit der abgestutzten Kegelspitze auf der Rüsselwand sitzen, und deren schräg abgeschnittene Basis am Rande verdickte spitz eiförmig Chitinplatte trägt" (Ehlers, 1868, p. 665); ". . . schräge Endfläche versehenen Rüsselpapillen" (Arwidsson, 1899, p. 19); ". . . pediculated oval papillae bearing inclined, winged, cuticular terminal plates" (Moore, 1911, p. 301); ". . . Papillen . . . schräg abgestützte Endplatte . . . die bei Profillage in Kantenstellung erscheint" (Augener, 1918, p. 387); ". . . cylindrical unguiculate papillae obliquely truncated with a kind of transparent chitinous nail at the tip" (Fauvel, 1932a, p. 126); ". . . papillae with terminal oblique, truncate plate" (Okuda, 1938, p. 94); ". . . papillae with cylindrical stems with oblique mamillate ends bounded by the flat wings" (Okuda, 1940, p. 16).

Most of these descriptions, as also others that might be cited, suggest a structure that is nailheaded or that has a terminal plate, such as is suggested by a nail. None mentions the presence of a terminal pore. Lack of uniformity in the various descriptions, based supposedly on the same species, suggests that these proboscidal organs, when observed, are either imperfect or not similarly oriented, both of which are very likely.

The essential parts consist of a fleshy elevation that terminates in a pore. A capelike vestment completely surrounds the basal part but leaves the distal part more or less free. At its lower base the cape is pouchlike; distally it is flaring, especially when its delicate membranes have become partly frayed or split. When perfect, its margin is entire but its inner surface shows fine, longitudinal striations (figs. 5, 6). Slide preparations under cover slips usually cause the sheath to fold so that its pouched lower portion is turned unnaturally to one side. Oil immersion views tend to reveal only optical sections, so that 3-dimensional relations are not easily interpreted. The fleshy organ has an internal canal that leads to one or a few large, clear basal cells in which there are numerous, small dark inclusions. The axial cells are not seen in unstained materials.

G. convoluta Keferstein is not easily separable from *G. alba* (Müller); differences that have been described are not too convincing, thus, those that concern the ailerons of the paragnaths and the comparative lengths of the branchial processes. It is further likely that *G. basibranchia* Chamberlin (1919b, p. 14) from southern California, is the same as specimens here designated *G. convoluta*, although earlier I (Hartman, 1936, p. 32) referred the name to *G. alba* (Müller). Fauvel (1923, p. 385) and others have noted the close relations of these 2 species.

A collection from San Pedro, California, reported as *G. alba* (Treadwell, 1914, p. 198), and another as *G. longipinnis* (Treadwell, 1914, p. 198) from the same locality, have been examined and are believed to be *G. convoluta* Keferstein; they are now deposited in the Allan Hancock Foundation.

Distribution.—This species was originally described from southern Europe but has since been recorded from California (Hartman, 1940, p. 247); its range is here extended to Lower California, Mexico north to Monterey Bay, California. It occurs in shallow depths to about 25 fms.

Glycera americana Leidy

Leidy, 1855, pp. 147-148, pl. 11, figs. 49, 50.

?*G. cirrata* Grube, 1856, p. 176.

G. corrugata Baird, 1863, p. 109.

G. peruviana Quatrefages, 1866, pp. 177-179.

G. jucunda Kinberg, 1866, p. 245.

G. laevis Kinberg, 1866, p. 245.

?*G. edentata* Hansen, 1882, p. 17, pl. 5, figs. 16-18.

G. rugosa Johnson, 1901, pp. 409-411, pl. 10, figs. 101-102.

Augener, 1934, pp. 143-144; Hartman, 1940, p. 246.

Not Rioja, 1944, p. 128, figs. 35-39.

Collections.—943-39 (3); 990-39 (2); 1003-39 (1); 1010-39 (3); 1012-39 (1); 1020-40 (2); 1030-40 (2); 1045-40 (4); 1068-40 (1); 1078-40 (1); 1121-40 (1); 1123-40 (1); 1126-40 (5); 1129-40 (1); 1130-40 (10); 1131-40 (1); 1133-40 (1); 1134-40 (1); 1135-40 (1); 1139-40 (2); 1142-40 (2); 1143-40 (1); 1160-40 (2); 1168-40 (1); 1191-40 (1); 1193-40 (1); 1202-40 (2); 1205-40 (2); 1207-40 (3); 1210-40 (2); 1211-40 (7); 1213-40 (1); 1226-41 (1); 1232-41 (1); 1235-41 (1); 1243-41 (1); 1254-41 (1); 1259-41 (1); 1260-41 (3); 1264-41 (1); 1265-41 (1); 1267-41 (1); 1276-41 (1); 1288-41 (1); 1295-41 (2); 1297-41 (1); 1300-41 (1); 1304-41 (1); 1356-41 (1); 1372-41 (2); 1390-41 (1); 1412-41 (2); 1413-41 (1); 1417-41 (1); 1441-41 (2); 1442-41 (several); 1444-42 (2); 1459-42 (1); 1463-42 (2); 1468-42 (2); 1472-42 (1); 1476-42 (3); 1477-42 (2); 1490-42 (4); 1493-42 (1); 1494-42 (1); 1496-42 (3); 1501-42 (1); 1502-42 (2); 1505-43 (2); others from central and northern California along shore (9); Puget Sound, Washington (3); North Carolina (about 30); Grand Isle, Louisiana, collected by Dr. E. H. Behre (3).

The type individuals of *G. jucunda* Kinberg (1866, p. 245) and *G. laevis* Kinberg (1866, p. 245) both from Brazil, deposited in the Swedish State Museum at Stockholm, Sweden, have been reexamined and are believed the same as *G. americana* Leidy. *G. corrugata* Baird (1863, p. 109) from Vancouver Island, western Canada, is also believed to be the same; it was said to lack branchial filaments but they may have been withdrawn, as is not infrequent in preserved materials.

Proboscoidal organs are of 2 kinds; the more numerous ones are the smaller, ovate or elongate in shape, and the larger ones are ovate to subspherical. The latter appear smooth and unadorned. The smaller ones have 2 obscure, transverse ridges on their distal halves, recalling the transverse bars of *G. robusta* Ehlers. The apical pore is nearly distal but is directed toward the oral aperture, when the proboscis is extended.

G. americana Rioja (1944, p. 128) from Argentina, is here believed to be a different species, since the proboscoidal organs are distinctly ridged, much as in *G. robusta* Ehlers.

Distribution.—*G. americana* Leidy occurs on both sides of the Americas; in the Atlantic it is known from New England south to Brazil; in the Pacific it is recorded from western Canada south to Peru.

It occurs in intertidal waters to 172 fms. It is further recorded from New Zealand (Augener, 1927b, p. 351) and south Australia (Augener, 1922, p. 29).

Glycera gigantea Quatrefages

Quatrefages, 1866, p. 183; Fauvel, 1923, pp. 387-388, fig. 152; Monro, 1928, p. 83; Berkeley, 1941, p. 34; Berkeley, 1942, p. 193. *G. sagittariae* McIntosh, 1885, p. 347; *not* Treadwell, 1906, p. 1174. *Collection*.—Plymouth, England (1).

Other material examined.—Type specimen of *G. sagittariae* McIntosh, at the British Museum, London, England.

The large, retractile vesicles on anterior face of parapodia are especially conspicuous when everted, but also readily observed as pores when retracted, based on materials examined. Such was not the case for specimens from Vancouver Island, Canada (Berkeley, 1942, p. 193).

The type specimen of *G. sagittariae* McIntosh (1885, p. 347) is 90 mm long and has over 190 segments. The prostomium has 13 or more rings. The proboscis has only soft organs; most are elongate but a few are globular. The aileron of the jaws has a single prolongation. Parapodial lobes consist of 2 presetal and 2 postsetal parts, the presetal ones much the longer. Branchiae are large, vesicular, retractile and present at least from segment 28. They emerge from the middle of the anterior parapodial surface. In the middle body region some are long, exceeding the other parapodial lobes in length; most are shorter and spherical; these differences may be the result of fixation. This specimen is clearly referable to *G. gigantea* Quatrefages. Its type locality was said to be Arrou Islands (McIntosh, 1885, p. 347) but off Tetuaroa Islands, South Pacific, (*loc. cit.*, p. xxviii).

G. sagittariae Treadwell (1906, p. 1174) from Hawaii, is here referred to *G. tessellata* Grube; *G. sagittariae* Fauvel (1932a, p. 127) from the Madras coast, may also be *G. tessellata* Grube, as Fauvel also surmised.

Distribution.—*G. gigantea* Quatrefages is known from Europe, and in the Western Hemisphere it is recorded from Tortola, Panama in 3-5 fms (Monro, 1928); southern California (Berkeley, 1941) and British Columbia, Canada in 70 meters (Berkeley, 1942).

Glycera capitata Oersted

Plate 11, figs. 1-4

G. nana Johnson, 1901, p. 411, pl. 10, fig. 103; Berkeley, 1942, p. 193. Moore 1911, pp. 299-300; Fauvel, 1923, p. 385; fig. 151; Berkeley, 1941, p. 33.

?*Hemipodia canadensis* Treadwell, 1937, pp. 348-349, figs. 1-3.

Collections.—887-38 (1); 915-39 (1); 992-39 (1); 994-39 (1); 1026-39 (1); 1036-40 (1); 1130-40 (3); 1131-40 (1); 1137-40 (1); 1142-40 (1); 1152-40 (1); 1168-40 (1); 1191-40 (1); 1192-40 (1); 1202-40 (1); 1214-40 (1); 1220-40 (1); 1223-41 (1); 1229-41 (1); 1274-41 (1); 1275-41 (1); 1288-41 (1); 1289-41 (1); 1300-41 (1); 1311-41 (1); 1321-41 (1); 1387-41 (5); 1388-41 (1); 1396-41 (3); 1402-41 (1); 1411-41 (1); 1412-41 (1); 1413-41 (1); 1422-41 (1); 1435-41 (1); 1436-41 (1); 1471-42 (fragments); 1479-42 (2); 1489-42 (1); Prince William Sound, Alaska, collected by W. E. Ritter (2); Port Orchard, Washington (1); San Francisco Bay, U.S.S. Albatross station D 5830 (1); Kodiak Island, Alaska (6); Sitka and vicinity, Alaska (20).

The numerous individuals listed above may be divided into 3 groups, based on the relative lengths of parapodial lobes. In one group the dorsal presetal lobe and ventral cirrus are short and smaller than the ventral presetal lobe (fig. 3); all of these specimens originate from northern waters including Alaska, Washington and Oregon. In a second group the dorsal presetal lobe and ventral cirrus are longer, about equal to, or approaching in size the ventral presetal lobe (fig. 1); these individuals originate from southern California. In a third group the dorsal presetal lobe and ventral cirrus are conspicuously longer and inflated, some have large ova (fig. 2); these may have also longer setae and are perhaps approaching an epitokous condition; these specimens originate from southern California and the Gulf of California (stations 1026-30, 1036-41, 1223-41, 1402-41 and 1422-41). On the whole, the individuals from Alaska are larger and more robust than those from California. The former attain a length of 150 mm, the latter 50 mm or less. Individuals from Washington and Oregon are intermediate in size.

The paragnathal aileron is broadly flaring at the base and has a long main slender fang (fig. 4). The proboscis organs are of 2 kinds; most are smaller, slender, thickly strewn over the surface; a few are larger, subspherical, distributed largely along the 18 longitudinal bands that correspond to the underlying muscular strands. All organs are soft, lacking surface ornamentation; they have a subterminal pore that is directed away from the jaws.

If the cold and warm water Pacific forms are distinct species, which I doubt, the specific name, *G. nana* Johnson (1901, p. 411) is to be retained for the northern group, the others go to *G. capitata* Oersted. The presence of intergrading individuals is an argument against such usage.

Hemipodia canadensis Treadwell (1937a, p. 348) from Nova Scotia, Canada, has both simple and composite setae, thus is not a species of *Hemipodus* Quatrefages. Its parapodial lobes resemble those of *G. capitata* Oersted, and in other respects, in so far as the description goes, it agrees with the latter.

Distribution.—*G. capitata* Oersted is known from temperate and cold waters of the northern hemisphere. It occurs on both sides of the north Atlantic and along the eastern shores of the north Pacific. The collections recorded above come from Alaska south to southern California and the Gulf of California, Mexico; depths range from shore to 250 fms.

Glycera tessellata Grube

Plate 10, fig. 11

G. abbranchiata Treadwell, 1901, p. 200.

G. sagittariae Treadwell, 1906, p. 1174, *not* McIntosh, 1885, p. 347.

G. nana Treadwell, 1914, p. 197, *not* Johnson, 1901, p. 411.

G. tessellata Hartman, 1940, p. 247; Hartman, 1944b, p. 18.

G. spadix Treadwell, 1943, p. 3, figs. 8-11.

Collections.—936-39 (1); 948-39 (1); 984-39 (1); 1016-39 (2); 1019-39 (1); 1023-39 (6); 1027-39 (1); 1028-39 (2); 1035-40 (1); 1056-40 (1); 1136-40 (5); 1151-40 (1); 1178-40 (1); 1181-40 (1); 1196-40 (1); 1213-40 (1); 1245-41 (2); 1306-41 (1); 1317-41 (1); 1334-41 (1); 1343-41 (1); 1349-41 (1); 1350-41 (1); 1381-41 (1); 1383-41 (1); 1392-41 (1); 1393-41 (2); 1400-41 (1); 1408-41 (1).

Other materials examined.—Type specimen of *Glycera spadix* Treadwell, from the American Museum of Natural History, New York, and *G. nana* Treadwell (1914) received from the University of California, Berkeley.

Proboscical organs are of a single kind but they differ among themselves as to size. All are long and slender so that the everted proboscis appears pilose. Under high magnification, with the aid of reflected light, the surface details can be distinguished. The organs are slightly beaked at the tip, and the distal aperture is directed away from the jaws. The surface is longitudinally grooved, the grooves marking the spaces between internal strengthening fibers. Each organ has 3 long, translucent

fibers within; they extend the full length and are appressed closely near the tip, but spread outward toward the base, so as to encompass the large, clear basal cell (fig. 11). When an organ is broken crosswise the fibers break off at uneven lengths, exposing their structural details. The same effect is to be seen on most preserved materials, since broken organs are frequent. The distal aperture is thus also often broken. The organ may be torn downward in front (or shorter side) leaving a longer strip in back; the longer part may then extend forward like a hood and be pulled laterally to resemble a flat plate (see Benham, 1916, pl. 47, fig. 24). It is possible that such an imperfect organ led Benham to say: "These papillae have a subterminal oval disc at one side of the apex, which appears sucker-like in that it slightly hollowed out." Furthermore, the same author stated that "the apex of the papilla carries a few stiff sensory hairs." The so-called "hairs" may have been optical aberrations, representing prolonged shadows made by the crenulations that mark the inner side of the aperture (fig. 11). Such shadows can be prolonged or curved at will, depending on the power and source of illumination.

A specimen reported as *G. nana* Treadwell (1914, p. 197) off San Clemente Island, California, 136 to 500 fms on green mud, has been reexamined and is here referred to *G. tessellata* Grube; it is now deposited in the Allan Hancock Foundation. *G. abbranchiata* Treadwell (1901, p. 200) from Puerto Rico, has been referred to this species (Augener, 1922b, p. 205).

The type specimen of *Glycera spadix* Treadwell (1943, p. 3) from the Gulf of Davao, Philippine Islands, catalogue no. 3241 in the American Museum of Natural History, has been examined and is here referred to *G. tessellata* Grube. The jaws consist of 4 dark sets with characteristic ailerons; each consists of 2 long, widely divergent fangs. The proboscidal organs are tall and slender, filiform, and completely cover the proboscidal surface. Parapodia are biramous, with simple notosetae and composite spinigerous neurosetae. The prostomium has more than 10 rings (there may be 12 to 14, as is the case in *G. tessellata* Grube) but the precise number is difficult to make out because the specimen has the anterior end somewhat withdrawn into the first few body segments.

Distribution.—*G. tessellata* Grube was originally described from the Mediterranean Sea; it is widely known from the West Indies, Caribbean Sea, tropical Pacific, and warmer waters of western America, north to British Columbia, Canada. It is recorded from sublittoral depths to 310 fms.

Genus *Glycerella* Arwidsson, 1899Type *G. magellanica* (McIntosh)

This monospecific genus has characters intermediate between *Glycera* Savigny (above) and *Hemipodus* Quatrefages (below). The prostomium is a very short cone, with few (4) annuli and the 4 terminal antennae are long by comparison; eyes have not been described. The proboscis is short and globular to somewhat prolonged when everted; its surface is strewn with many long organs in irregular arrangement. The 4 terminal jaws have a falcate piece that articulates with an aileron that is rodlike but not so slender as that in species of *Hemipodus*. Body segments are transversely marked so as to appear 2- or 3-annulate. All parapodia are biramous; notopodia have slender, simple notosetae that are supported by single rodlike acicula. Neuropodia have fanshaped fascicles of composite falcigers; spinigers have not been described. The falcigerous appendage is longer in the superior part of the fascicle, and gradually becomes shorter in the inferior part of the fascicle.

The single species, *G. magellanica* (McIntosh) (1885, pp. 345-351) is characterized for having a dark band about the basal ring of the prostomium. Noto setal lobes in the anterior region of the body are long and pointed; they exceed in length the neurosetal lobes. Dorsal cirri are prolonged oval; ventral cirri are blunt and broad. The proboscicial organs are very long, nearly cylindrical and closely set. Number of segments is about 96; length is about 35 mm and width about 3 mm.

Distribution.—*Glycerella magellanica* is recorded from the Strait of Magellan in 345-400 fms, and off the Azores in 736-1229 meters (Fauvel, 1914, p. 207).

Genus *Hemipodus* Quatrefages, 1866Type *H. roseus* Quatrefages

This is spelled also *Hemipodia* Kinberg, 1866.

If the genotype, *H. roseus* Quatrefages, 1866, can be proven conspecific with *H. simplex* (Grube), 1856, the latter becomes the genotype since it is the older.

The genus derives its name for having uniramous parapodia throughout. It comprises a small group of species restricted to littoral zones in the Pacific Ocean. All species are usually smaller and slenderer than many species in the superfamily GLYCEREA.

The prostomium is conical but the annuli are only vaguely visible; they comprise a variable, 7 to 10 or more, number. Prostomial eyes have not been described. The anterior end has 2 pairs of antennae, much as

in species of *Glycera*. The proboscis is long (*H. californiensis*, below) to short and barrel-like (*H. yenourensis* Izuka). Its distal end is provided with 18 short, fleshy, widely spaced papillae. The distal armature consists of 4 falcate jaws and attached rodlike ailerons (pl. 12, fig. 1). The proboscicidal organs, in all instances where they have been described are elongate oval or filamentous structures, with little (pl. 12, fig. 2) or no surface ornamentation. These organs are more or less thickly strewn over the surface, but the 18 longitudinal furrows are more clearly distinguishable than in species of *Glycera*. Body segments are usually more or less clearly bi- or triannulate.

Parapodia consist of only neuropodia, with fanshaped fascicles of composite spinigers and single acicula. The presetal lobe is simple, entire and tapers distally to a shorter or longer triangular process; it exceeds in length the postsetal lobe which is also entire, broadly rounded; usually it is much shorter than the presetal lobe. The first 2 pairs of parapodia resemble those farther back but are smaller and lack a dorsal cirrus. Farther back the dorsal cirrus is present and continued to the end; it usually has a thickened fleshy boss near its base. This character has been observed for all species I have examined. In the last few segments the ventral cirrus enlarges so as to resemble the postsetal lobe; the dorsal cirrus diminishes in size.

The body terminates in segments that taper distally to a slender end and a pygidium with a pair of short to longer conical or filamentous processes.

Specific differences that distinguish the species from one another are especially to be found in the proboscicidal organs, and the comparative lengths of the presetal parapodial lobes. The genus is known for 6 species, including one newly described. In order of their discovery, they are: *H. simplex* (Grube), 1856, *H. roseus* Quatrefages, 1866, *H. borealis* Johnson, 1901, *H. yenourensis* Izuka, 1912, *H. californiensis* Hartman, 1938, and *H. armata*, new species. The genus is partly reviewed elsewhere (Hartman, 1940, pp. 242-244). *H. yenourensis* Izuka, from Japan, has been referred to *H. borealis* (Okuda, 1939, pp. 234-236, fig. 9) but I consider the 2 distinct (see chart, following).

COMPARISON OF SPECIFIC CHARACTERISTICS IN THE GENUS *HEMIPODUS*

	Length of body in mm	Color in life	Nature of body segments	Character of presetal lobe	Proboscial organs: Length/width index, shape, etc.	Number of segments
<i>H. borealis</i> Johnson	70-100	red	beadlike	long and triangular	3/1 for the longer, 7/5 for the shorter; oval to subspherical	126 or more
<i>H. californi- ensis</i> Hartman	150-250	green	cylindrical	short and triangular	12/5, oval	170-220
<i>H. roseus</i> Quatrefages	40	rose	?beadlike	prolonged triangular	?	about 120
<i>H. simplex</i> Grube	40-45 or more	?	?beadlike	prolonged triangular	3/2. depressed, nearly equitriangular	about 107-112
<i>H. yenuourensis</i> Izuka	45-110	yellowish white with brown pig- ment at tips of parapodia	slightly beadlike	prolonged digi- tate becoming prolonged triangu- lar in back	5/1, very long, filamentous	about 140-150
<i>H. armata</i> , new species	37+	?	beadlike	prolonged coni- cal with a fila- mentous tip	28/5, long, fila- mentous, with trans- verse ridges on one side.	71+

GEOGRAPHIC DISTRIBUTION OF THE SPECIES OF *HEMIPODUS*, WITH BIBLIOGRAPHIC CITATIONS

Name of Species	Geographic Distribution				
	Alaska	California	Western Mexico	Western South America	Patagonia and Cape Horn Japan and Manchuria New Zealand
<i>H. borealis</i> Johnson	Hartman, 1948a, p. 28	Hartman, 1948a, p. 28	Rioja, 1941, p. 709		
<i>H. californiensis</i> Hartman		Hartman, 1940, p. 243	Rioja, 1941, p. 709		
<i>H. roseus</i> Quatrefages				Arwidsson, 1899, p. 29	
<i>H. simplex</i> (Grube)				Ehlers, 1901, p. 155	Fauvel, 1941, p. 284 Ehlers, 1905, p. 37; Augener, 1927b, p. 351
<i>H. yenourensis</i> Izuka					Fauvel, 1933, p. 45; Okuda, 1939, p. 234, as <i>H. borealis</i> .
<i>H. armata</i> , n.s.			see below		

Hemipodus armatus, new species

Plate 12, figs. 1-5

Collection.—265-34 (1).

The single individual is posteriorly incomplete; it measures 37 mm for 71 segments and is 1.3 mm wide at its greatest width. Segments are biannulate, with the parapodial ring slightly the longer one. The prostomium is much longer than wide and lacks visible annulation; its length is about 5 times its width. There are no visible eyespots. The 4 terminal antennae are filamentous and taper distally; the 2 ventral ones are longer than the 2 dorsal ones.

The proboscis is completely everted and torn away from the oral aperture so as to be nearly detached; it is 7 mm long and widest at its paragnathal end. Its most striking feature concerns the proboscidial organs that closely cover it all around; they resemble transversely ridged villi because of their tall, slender form. All are apparently of one kind, except those near the base of the proboscis which are smaller than the others. Seen singly (fig. 2) they are slightly beaked at the terminal end, the beak directed away from the distal jaws; each has 30 to 34 transverse ridges on the concave side; the aperture is subterminal and with favorable illumination, can be seen to contain a large cell near the base, with an internal canal and axial cells more distal. These organs are much like those shown for some species of *Glycera* (compare plate 10) and thus differ from those of other species of *Hemipodus*.

Paragnaths are hard and very dark to black; the embedded aileron is a nearly straight rod (figs. 4, 5); it is attached to the jaw near the middle. The first parapodia are minute but similar to the second one and those farther back. They gradually increase in size so as to be fully developed by the tenth segment. All are uniramous (fig. 3), have single yellow acicula and composite spinigerous setae. The dorsal cirrus is globular and located some distance above the fleshy parapodium. The ventral cirrus is larger, slightly compressed and emerges directly below the parapodial base. A digitate process at the distal end of the presetal lobe and abruptly emergent from its posterior margin, is specifically characteristic (fig. 3).

Setae are arranged in fanshaped fascicles and, where best developed, number 10 to 12 in a row. They have an articulation that is nearly homomorph. In the specimen, taken March 3, 1934, the body cavity, including the coelom in the everted proboscis is crowded with ova.

H. armatus is separable from other species of the genus in its unique proboscidial organs that are marked with 30 to 34 transverse ridges,

and in the slender digitate process at the distal end of the presetal lobe.

Holotype.—from station 265-34 in the Allan Hancock Foundation.

Type locality.—Petatlan Bay, western Mexico, in 5-10 fms.

Distribution.—Western Mexico.

Family **Nephtyidae** Grube, 1850

The family NEPHTYIDAE Grube, as Nephthydea Grube, 1850, is here recognized for 3 genera, *Nephtys* Cuvier, 1817, with type *N. hombergi* Audouin and Edwards, *Aglaophamus* Kinberg, 1866, with type *A. lyratus* Kinberg and *Micronephthys* Friedrich, 1939, with type *M. minuta* (Théel). About 40 species go to the first genus, 21 to the second and 4 to the third. In addition, there are 7 to 10 species too poorly known to reidentify and here regarded questionable or indeterminate. The family thus comprises 65 or more species.

In this report the 3 genera are newly interpreted. Six species, *Nephtys glabra*, *N. assignis*, *N. singularis*, *N. acrochaeta*, *Aglaophamus dicirris*, *A. erectans* and one subspecies, *Aglaophamus rubella anops* are newly described. One name, *Nephtys monroi*, is new; two species, *Nephtys impressa* Baird and *Aglaophamus tabogensis* (Monro) are revised. New combinations are given in the genera *Aglaophamus* and *Micronephthys*.

The NEPHTYIDAE are partly recorded elsewhere (Hartman, 1940) and are not here repeated except as ranges are extended. The present report concerns itself with materials that have since been deposited in the Allan Hancock Foundation of the University of Southern California, together with a revision of important or type materials that have been examined.

In the NEPHTHYIDAE the body is only moderately long and approximately broadly rectangular in cross section. Length (adult) ranges from 10 to 300 mm; segments number 150 or fewer. The prostomium is proportionately small, depressed and angulate, 4 to 6-sides, when seen from above. There are usually 2 pairs of simple, rarely bifid, prostomial antennae; one pair is at the anteroectal margins, the other at the sides of the prostomium. (*Portelia* Quatrefages was separated from other genera for having only one pair of antennae but this has been found erroneous.) Eyes are absent or present as a single pair near the posterior margin of the prostomium. A pair of nuchal organs, or eversible ciliated sacks is located at the postectal margins of the prostomium.

The proboscis is a strong, muscular, eversible anterior part of the alimentary tract. When fully extended it is cylindrical or somewhat clavate. Its inner wall is armed with a pair of short, usually yellow or

brown horny jaw pieces located a short distance from the terminal end. It opens as a vertical slit that is bounded distally by 14 to 22 soft, bifid papillae, the shorter branch directed inward, the larger one forward. At the subdistal outer end there are 14 to 22 rows of similar processes (rarely the terminal and subterminal papillae are absent). The proximal surface of the proboscis is smooth or finely prickled to wartlike. In so far as can be seen, all of these various processes have no single large pore, as do the comparable organs in the GLYCEREA (above). In some species, notably *Nephtys cilata*, the dispersed proximal processes are covered over with a thickened cuticle which may be penetrated by many fine pores. The papillae have a broad base and the distal end is directed away from the terminal papillae, agreeing therein with the condition in the GLYCEREA. Some species are characterized for having a small to large median tentaclelike process, similar to the other subdistal papillae, located at the middorsal or also midventral line; these probably represent the fusion of a pair of proximal processes. The underlying muscular and glandular layers have been investigated (Charrier, 1907).

The peristomium or first setigerous segment is usually reduced in its notopodial portion. It differs from successive ones in being narrower and in having its parapodia more or less developed; in some species they may be directed forward at the sides of the prostomium. The first few segments may develop gradually, or the second may be abruptly larger than the first. Typical parapodia are clearly biramous with the 2 branches widely separated from each other. Each ramus has an aciculum and setae arranged in preacicular and postacicular series. Acicula are completely embedded or somewhat projecting distally, or recurved at the tip. Acicular lobes are distally rounded, conical, incised or excavate; their character has specific value.

Presetal and postsetal parapodial lobes are highly developed and characteristic for species. A distal extension of the notopodial postsetal lobe, at its inferior edge is here designated notopodial cirrus (=dorsal cirrus of some authors) since it is an outgrowth of the lower, not upper, edge of the notopodium. This cirrus may be slender to foliaceous, small to large. Continuous with it from its lower base, and hence also notopodial in origin, is the interrhamal cirrus or intercirrus (=branchia of some authors); it extends distally as a sickle-shaped or cirriform process, between the widely spaced branches of the parapodia. Its lateral edges may be smooth, frilled or foliaceous. These processes are recurved (pl. 13, fig. 3) in species of *Nephtys* Cuvier, involute (pl. 18, fig. 3) in those of *Aglaophamus* Kinberg, and absent or nearly so in those of *Micro-*

nephthys Friedrich. Since the lateral margins of these cirri are sometimes heavily ciliated, they have been thought to be branchial in function.

The ciliary mechanism of the interrampal cirri has been studied in some detail (Coonfield, 1931 and 1934) based on *Nephthys buccera* Ehlers. Here the cilia on the parapodia are in a single row, beginning on the outside of the interrampal cirrus at its base, continuing around the tip on its inner side and extending on the body wall to the base of the neuropodium. In these regions the cilia are grouped into small tufts. Each tuft is limited to a single cell and consists of 40 to 50 large compound cilia; each compound cilium is again made up of smaller units. Physiological tests performed by Coonfield (loc. cit.) indicate that each ciliated cell is independent of the nervous system, regulating its own activity. The coordination attained in situ is believed to be dependent on a neuroid mechanism. The effective beat of the cilia is from the head of the worm toward the tail. This beating causes a current of water to flow on each side of the worm posteriorly in the groove formed by the division of each parapodium into a neuropodium and a notopodium.

The neuropodium resembles the notopodium in its setal parts but in reverse order; at its lower base is a tapering ventral cirrus. In some species the superior edge has an erect process or accessory neuropodial lobe (pl. 18, fig. 3) (=accessory branchia of some authors). The body tapers backward and ends in a narrow, collarlike pygidium with a long median, filiform process or also a pair of shorter ones.

All setae are simple, not articulated, and they may be of several kinds. They are arranged in preacicular and postacicular, fanshaped fascicles. According to kind they occupy certain positions. Those in preacicular position are transversely barred (pl. 13, fig. 9) in their distal free portion and taper to slender pointed tips. The alternating light and dark areas of these setae (sometimes called fenestrated) are due, not to external ridges, but to an internal structure of alternating harder and softer substance. Postacicular setae are usually longer (except in some anterior segments where they may be weakly developed) coarser, and often bladelike. They are sometimes called lanceolate setae. They may be quite smooth, especially those at the ends of the series, or the outer cutting edge may be serrated (pl. 13, fig. 4) or denticulate (pl. 15, fig. 4) or diffusely spinose (pl. 18, fig. 5) or with a few large teeth near the base (*Nephthys picta* Ehlers), or there may be a large spur near the base (pl. 16, fig. 5). This character has been found to be highly specific in the species investigated; it also shows a remarkable degree of specialization.

The postacicular series of setae may be accompanied by furcate (=lyrate or forked) setae (pl. 18, fig. 4) most characteristic for the species of *Aglaophamus* Kinberg. The size of these setae and the position they occupy with respect to the ornamented postacicular setae, suggests their function for clearing the latter from debris.

Color in life is often pearl to slate gray with an iridescent sheen in species from littoral zones; deep water species tend to be orange or red, as are other inhabitants with which they occur. The anterior dorsal side may be overlain with a dark pigment pattern in characteristic arrangement. The ventrum is usually paler and tends to lack pigment.

Species of NEPHTYIDAE are chiefly to be sought in fine sand, mud or soft shaley substrata. They are errantiate in habit. Tubes are not constructed but burrows are sometimes distinct. Most species are littoral but some have been recorded from depths to 2500 fms. Most species are stenohaline, but 2 species, *Nephtys fluviatilis* Monro and *N. oligobranchia* Southern, are described from freshwater.

Sexes are separate but distinguishable only for differences in the color of gonads. Ova are typically produced in great number; they are small with little yolk. Laboratory culture has been attempted with little success (Wilson, 1936, p. 305). Development probably proceeds through pelagic trochophore (see Fuchs, 1911, p. 164) to polytroch stages and settling young. Planktonic polytrochs, with the characteristic barred setae, are occasionally captured in nets along shore, but no successful attempt has been made to carry such individuals through more than a few days. The numerous long setae tend to get stuck and individuals disintegrate. Epitoky, involving the prolongment of setae and enlargement of parapodial lobes, is known for some species (Fage and Legendre, 1927, pp. 124-128 and Augener, 1912, pp. 200-212).

All known members of the family are so closely related to one another that no doubt exists as to their affinities within the group. Thus, the family has usually been recognized for a single genus, *Nephtys* Cuvier (spelled also *Nephtys* Savigny, 1818, *Nephtys* Chamberlin, 1919a, *Nephtis* Audouin and Edwards, 1834), although several other genera including *Portelia* Quatrefages, *Diplobranchus* Quatrefages, *Aglaophamus* Kinberg and *Aglaopheme* Kinberg have been long erected and received occasional recognition. *Micronephthys* Friedrich has been most recently founded. *Portelia* and *Diplobranchus* were based on errors concerning the number of prostomial antennae; *Aglaophamus* and *Aglaopheme* were separated from the older *Nephtys* for obscure differences concerning the structure of the maxillary jaw pieces. Up to now

no satisfactory separation has been made to divide the family; as a result, it has been difficult or impossible to distinguish many of the species from one another.

Important geographic studies have been those of Heinen (1911, pp. 6-36) who described 11 (8 valid) species from the Baltic Sea, McIntosh (1908, pp. 1-40) who recorded 10 species in the fauna of Great Britain, Fauvel (1923, pp. 362-376) who gave 12 species in the fauna of France. Ehlers (1868, pp. 582-638) made valuable contributions on many structures unknown before then. Recently Wesenberg-Lund (1949, pp. 292-296) has described 4 species from the Iranian Sea. As seen below, the nephtyids of the northeast Pacific from Alaska to western Mexico, can be regarded as including 13 species in *Nephtys* and 3 in *Aglaophamus*.

A brief summary of previous accounts is necessary to justify the restoration of *Aglaophamus* Kinberg. Quatrefages (1865, pp. 413-435) recognized *Nephtys* Cuvier and erected 2 new, *Portelia* and *Diplobranchus*, erroneously supposing the last 2 to have one pair and no antennae respectively. Kinberg (1866, p. 239) recognized 4 genera, *Nephtys* (sic) *Portelia*, and 2 newly erected ones, *Aglaophamus* and *Aglaopheme*. These 4 were separated from one another for supposed differences in the embedded proboscival jaws. In *Nephtys* they were said to be unguulate, in *Aglaophamus* transverse and fusiform, and in *Aglaopheme* laterally depressed, subconical pieces with a trilobed base; they were not described for *Portelia*. Kinberg referred 3 species to *Nephtys* and single species to each of the other genera.

Ehlers (1868, pp. 582-638) reviewed the earlier studies and concluded that Kinberg's separation was invalid; he suppressed *Aglaophamus* and *Aglaopheme* under *Nephtys* (sic); *Portelia* Quatrefages was reserved for those species (*P. rosea* Quatrefages and possibly *Nephtys polyphara* Schmarda) in which the prostomium was thought to have only 2 antennae and the pygidium one pair of processes. Fauvel (1923, p. 369) questionably referred the type of *Portelia* to *Nephtys cirrosa* Ehlers, thus suppressing this as a valid generic name. The family was thus again reduced to a single genus, *Nephtys* Cuvier. It is noteworthy that Langerhans (1879, p. 305) had suggested dividing the family into 2 genera on the basis of the number of rows of proboscival papillae, whether 22 or 14- but this author continued to use the name *Nephtys* (sic) for both groups of species.

Micronephthys Friedrich (1939, p. 123) was erected for one species, *Nephtys minuta* Théel, from the Russian Arctic Ocean. At least 2 others may be considered congeneric (see below). It should be

noted, however, that this genus is characterized mainly for reduction or loss of parts, and for the small size of its individuals, and apparently not for any major morphological character such as separates *Nephtys* from *Aglaothamus*.

A conspicuous character among species of this family concerns the nature of the interramal cirri (=intercirri). In species of *Nephtys* they are distinctly curved outward or recurved (pl. 13, fig. 3); in species of *Aglaothamus* they are curved inward or involute (pl. 18, fig. 3). In *Micronephthys* the interramal cirri are nearly or quite absent. Most of the numerous species of the family can thus be referred to one of these 3 groups. Other less obvious, though perhaps more significant, characters typically accompany this feature. Thus, furcate setae (pl. 18, fig. 4) are usually present in species with involute cirri; their presence is doubtful for species in the other 2 groups. Acicular lobes appear on the whole more acutely pointed in species of *Aglaothamus* and are usually rounded or incised in species of *Nephtys*. The aciculum is frequently sharply recurved at the tip (pl. 19, fig. 4) in species of *Aglaothamus* and bluntly conical in species of *Nephtys*.

KEY TO GENERA OF NEPHTYIDAE

- Interramal cirri recurved (pl. 13, fig. 3) *Nephtys*, p. 89
Interramal cirri involute (pl. 18, fig. 3) . . . *Aglaothamus*, p. 116
Interramal cirri absent or nearly so *Micronephthys*, p. 130

Genus *Nephtys* Cuvier, 1817

Type *N. ciliata* (Müller)

This has been spelled also *Nephthys* Savigny, 1818, *Nephtis* Audouin and Edwards, 1834, *Nephtys* Chamberlin, 1919a. It includes *Portelia* Quatrefages, 1865, *Diplobranchus* Quatrefages, 1865, and partly *Aonis* Savigny, 1818.

Interramal cirri are recurved and present on most body segments. In shape they are cirriform to clavate; their lateral margins may be expanded, flattened or foliaceous to somewhat frilled. Preaccicular setae are usually transversely barred; postaccicular setae are lanceolate and may have a margin that is entire, or delicately serrated, or denticulate, or with a few sharp teeth or a spur. Parapodial acicula occur singly and are pale to dusky in color; they are embedded or project slightly. Acicular lobes may be incised to broadly or gently rounded at the distal edge.

The following 96 specific or subspecific names have been referred to this genus; 40 names in *italics* type are regarded as valid species of *Nephtys*; 21 others are referred to the genus *Aglaophamus* and 4 others to the genus *Micronephthys*.

N. abbranchiata Ehlers, 1913, see *Micronephthys abbranchiata*.

N. acrochaeta, new species, see p. 114.

N. agilis Langerhans, 1879, see *Aglaophamus agilis*.

N. (Aglaophamus) inermis Ehlers, 1887, see *Aglaophamus inermis*.

A. ambrizettana Augener, 1918, see *Micronephthys ambrizettana*.

N. assignis, new species, see p. 112.

N. assimilis Oersted, 1843, see *Nephtys hombergi*, Fauvel, 1923, p. 367.

N. atlantica Hansen, 1878, indeterminate

N. bononensis Quatrefages, 1865, p. 425, see *Nephtys caeca*

N. borealis Oersted, 1843, p. 43, see *Nephtys ciliata*

N. brachycephala Moore, 1903, p. 431, from Japan

N. buccera Ehlers, see p. 105.

N. caeca (Fabricius), see p. 95.

N. caecoides Hartman, see p. 101.

N. californiensis Hartman, see p. 103.

N. canadensis McIntosh, 1900b, p. 264, from eastern Canada, questionable

N. ciliata (Müller), see p. 95.

N. circinnata Verrill, 1874, see *Aglaophamus macroura*

N. cirrosa Ehlers, 1868, p. 624, see Fauvel, 1923, p. 369, fig. 144.

N. cirrosa longicornis Jakubovi, 1930, p. 871, from Sevastopol, Russia.

N. cornuta Berkeley, see p. 106.

N. cuvieri Quatrefages, 1865, p. 421, questionably *Nephtys hombergi*, see Fauvel, 1923, p. 367.

N. dibranchis Grube, 1878a, see *Aglaophamus dibranchis*.

N. digitifera Augener, 1933a, see *Aglaophamus lyratus*.

N. discors Ehlers, see p. 96.

N. dussumieri Quatrefages, 1865, p. 426, from Malabar, indeterminate.

N. ectopa Chamberlin, 1919a, p. 94, off Peru.

N. edwardsii delle Chiaje, 1828, p. 175, indeterminate, see Quatrefages, 1865, p. 532.

N. ehlersi Heinen, 1911, p. 34, see *Nephtys hombergi kersivalensis*.

N. emarginata Malm, 1874, p. 77, see *Nephtys longosetosa*.

N. ferruginea Hartman, see p. 102.

N. fluvatilis Monro, 1937, p. 246, from Uruguay, freshwater.

N. glabra, new species, see p. 109.

N. glossophylla Schmarda, 1861, p. 90, from Chile, indeterminate.

- N. gravieri* Augener, 1913, p. 123, from southwestern Australia.
N. grubei McIntosh, 1908, see *Aglaophamus malmgreni*.
N. hirsuta Dalyell, 1853, p. 145, questionably *Nephtys caeca*, see McIntosh, 1908, p. 16.
N. hombergi Audouin and Edwards, see p. 101.
N. hombergi kersivalensis McIntosh, 1908, p. 21, from the British Isles.
N. hombergi vasculosa McIntosh, 1908, p. 21, see *N. hombergi*, Fauvel, 1923, p. 367.
N. hudsonica Chamberlin, 1920, p. 10B, from Hudson Bay, Canada.
N. hystricis McIntosh, 1900b, p. 259, from the Mediterranean Sea.
N. imbricata Grube, 1856, p. 168, from Chile, incompletely known.
N. impressa Baird, revised, see p. 97.
N. incisa Malmgren, see p. 108.
N. incisa bilobiata Heinen, 1911, p. 26, see *Nephtys incisa*.
N. ingens Stimpson, 1853, p. 33, see *Nephtys incisa* or *N. caeca*.
N. laciniosa Grube, 1881, p. 112, from Brazil, indeterminable.
N. lactea Malmgren, 1868, p. 141, from Greenland, indeterminable.
N. lawrencii McIntosh, 1900a, p. 265, from eastern Canada, questionable.
N. lobophora Hartman, 1940, see *Aglaophamus lobophorus*.
N. longipes Stimpson, 1856, p. 392, from Australia, indeterminable.
N. longisetosa Malmgren, 1866, p. 106, see *Aglaophamus malmgreni*.
N. longosetosa Oersted, 1843, p. 195, from North Atlantic, see Fauvel, 1923, p. 367.
N. lutrea Baird, 1873, see *Aglaophamus lutreus*.
N. lyrochaeta Fauvel, 1902, see *Aglaophamus lyrochaetus*.
N. macandrewi Baird, 1873, see *Nephtys hombergi*, p. 101.
N. macroura Schmarda, 1861, see *Aglaophamus macroura*.
N. macroura peruana Hartman, 1940, see *Aglaophamus peruana*.
N. maeotica Czerniawsky, 1882, p. 198, see *Nephtys hombergi*, according to Ostroumov, 1896, p. 111.
N. magellanica Augener, see p. 100.
N. malmgreni Théel, 1879, see *Aglaophamus malmgreni*.
N. margaritacea Johnston, 1835, p. 341, see *Nephtys caeca*, Fauvel, 1923, p. 365.
N. minuta Théel, 1879, see *Micronephthys minuta*.
N. mirasetis Hoagland, 1920, see *Aglaophamus*, questionably *dibranchis*.
N. modesta Grube, 1878a, p. 535, from Kerguelen Islands, incompletely known.

- N. monroi*, new name, see p. 107.
- N. neapolitana* Grube, 1840, p. 71, see *Nephtys hombergi*, Fauvel, 1923, p. 367.
- N. nudipes* Ehlers, 1868, p. 635, see *Nephtys cilata*.
- N. oerstedii* Quatrefages, 1865, p. 427, from Greenland, see *Nephtys caeca*, Fauvel, 1923, p. 365.
- N. oligobranchia* Southern, 1921, p. 610, from India. Okuda, 1943, pp. 99-103, describes this from China, freshwater.
- N. palatii* Gravier, 1904, p. 472, from the Red Sea. Fauvel, 1919a, pp. 424-425, describes this from Djibouti.
- N. panamensis* Monro, see p. 101.
- N. pansa* Ehlers, 1875, p. 40, see *Nephtys paradoxa*.
- N. paradoxa* Malm, see p. 111.
- N. phyllobranchia* McIntosh, see p. 111.
- N. phyllocirra* Ehlers, see p. 108.
- N. picta* Ehlers, see p. 103.
- N. polybranchia* Southern, 1921, p. 607, from India. Fauvel, 1932a, p. 119, regards it a possible variety of *N. oligobranchia*, and records it from China, in nearly freshwater.
- N. polyphara* Schmarda, 1861, see *Aglaophamus polyphara*.
- N. praetiosa* Kinberg, 1886, see *Aglaophamus macroura*.
- N. punctata* Hartman, see p. 96.
- N. rickettsi* Hartman, see p. 97.
- N. rubella* Michaelsen, 1897, see *Aglaophamus rubella*.
- N. schmitti* Hartman, 1938b, p. 152, from the northeast Pacific.
- N. scolopendroides* Chiaje, 1828, p. 424, see *Nephtys hombergi*, Fauvel, 1923, p. 367.
- N. serratifolia* Ehlers, 1897, p. 24, off the Falkland Islands. This was first described with recurved cirri, the proboscis with 20 terminal papillae and 15 subdistal rows with 6-7 in a row. Monro, 1930, p. 114, redescribed it with involute cirri, and Augener, 1922a, p. 19, suggests affinities with *Aglaophamus dibranchis*.
- N. singularis* new species, see p. 98.
- N. sphaerocirrata* Wesenberg-Lund, 1949, see *Micronephthys sphaerocirrata*.
- N. spiribranchis* Ehlers, 1918, p. 235, see *Aglaophamus spiribranchis*.
- N. squamosa* Ehlers, see p. 110.
- N. stammeri* Augener, 1932, p. 663, is not a NEPHTYIDAE, but see under *Micronephthys*.
- N. tagobensis* Monro, 1933a, see *Aglaophamus tabogensis*.
- N. trissophyllus* Grube, 1878b, see *Aglaophamus macroura*.

N. tulearensis Fauvel, 1919a, pp. 422-424, from Madagascar.

N. verrillii McIntosh, 1885, see *Aglaophamus*, questionably *A. di-branchis* or *A. dicirris*.

KEY TO SPECIES OF *Nephtys*

1. Interramal cirri foliaceous in some parapodia 2
1. Interramal cirri not foliaceous 3
2. Interramal cirri first present from about segment 13; post-acicular setae obscurely dentate at the cutting edge . . .
. *N. phyllobranchia*, p. 111
2. Interramal cirri first present from segment 8-10; postacicular setae more distinctly dentate *N. paradoxa*, p. 111
2. Interramal cirri first present from segment 4 and continued back to near end; prostomium with a pair of eyes at the posterior margin *N. tulearensis*, p. 93
3. Proximal surface of proboscis strewn with prickles, warts or other processes 4
3. Proximal surface of proboscis smooth or only wrinkled . . 7
4. Interramal cirri not present before about segment 10 and continued back to about the twentieth last segment; acicular lobes incised *N. punctata*, p. 96
4. Interramal cirri present before segment 8 5
5. Postacicular lobes conspicuous 6
5. Postacicular lobes restricted; interramal cirri first present from segment 6 and continued to seventeenth last segment . . .
. *N. rickettsi*, p. 97
6. Postacicular setae long, flowing, in thick fascicles; proboscis with a middorsal papilla *N. cilata*, p. 95
6. Postacicular setae project outward in stiff bundles; proboscis without a middorsal papilla *N. caeca*, p. 95
7. Postacicular setae with a large spur (pl. 16, fig. 6) . . .
. *N. acrochaeta*, p. 114
7. Postacicular setae without spur 8
8. Dorsolateral surface of body overlain by closely imbricated expansions of notopodia (lacking in juveniles); dorsal and ventral postsetal lobes foliaceous and greatly prolonged at sides; anterior neuropodia with an erect superior lobe . . .
. *N. squamosa*, p. 110
8. Dorsolateral surface of body not overlain by notopodial expansions; postsetal lobes not so prolonged; neuropodial erect lobe absent or present 9

9. Neuropodia with an erect lobe at the superior edge . . . 10
9. Neuropodia without an erect lobe at the superior edge . . . 12
10. Interramal cirri first present from segment 4 . . . 11
10. Interramal cirri first present from segment 8 *N. monroi*, p. 107
11. Proboscis with a large median papilla; superior neuropodial lobe continued far back . . . *N. impressa*, p. 97
11. Proboscis without a median papilla; superior neuropodial lobe present in a few anterior segments . . . *N. singularis*, p. 98
12. Prostomium with a pair of black eyespots on the posterior half; interramal cirri present from segment 3 *N. magellanica*, p. 100
12. Prostomium without such eyespots . . . 13
13. Middle setae in postacicular fascicles with a few coarse teeth . . . 20
13. Postacicular setae without a few coarse teeth . . . 14
14. Neuropodial postsetal lamella greatly prolonged and foliaceous in median and posterior regions, greatly surpassing the corresponding notopodial lobe (pl. 18, fig. 3) . . . 15
14. Neuropodial postsetal lobe not so prolonged . . . 16
15. Anterior margin of second segment with a pair of eyespots; notopodial preacicular lobe conspicuously excavate (pl. 17, fig. 2) . . . *N. hombergi*, p. 101
15. Without eyespots on second segment; notopodial preacicular lobe incised but not excavate . . . *N. assignis*, p. 112
16. Interramal cirri first present from segment 6 or 7 . . . 17
16. Interramal cirri first present from segment 3 to 5 . . . 18
17. Anterior acicular lobes broadly rounded (pl. 13, fig. 3) . . . *N. glabra*, p. 109
17. Acicular lobes conical and prolonged . . . 17a
- 17a. Dorsal postsetal lobe foliaceous; preacicular barred setae inconspicuous and few in middle and posterior segments . . . *N. phyllocirra*, p. 108
- 17a. Dorsal postsetal lobe little developed; preacicular barred setae not so reduced . . . *N. incisa*, p. 108
18. Acicular lobes conical . . . 19
18. Acicular lobes usually broadly rounded to incised . . . 21
19. Interramal cirri first present from segment 3; postacicular setae toothed at outer edge . . . *N. panamensis*, p. 101
19. Interramal cirri first present probably from segment 5; postacicular setae smooth; posterior prostomial antennae bifid . . . *N. cornuta*, p. 106

20. Anterior dorsum marked with dark transverse bars; proboscidal jaws amber with dark tips *N. picta*, p. 103
20. Anterior dorsum pale; proboscidal jaws dark brown *N. buccera*, p. 105
21. Proboscis with a middorsal papilla; postacicular setae stiff; pigmented pattern of prostomium and first few segments typically extensive 22
21. Proboscis without a middorsal papilla; postacicular setae soft, flowing; pigmented pattern of proboscis limited *N. californiensis*, p. 103
22. Interramal cirri first present from fourth segment; posterior neuroacicular lobes incised *N. caecoides*, p. 101
22. Interramal cirri first present from third segment; posterior neuroacicular lobes conical *N. ferruginea*, p. 102

Nephtys ciliata (Müller)

Fauvel, 1923, p. 371, fig. 145; Hartman, 1938, pp. 144-145; Berkeley, 1942, p. 193; Hartman, 1944c, p. 339, pl. 47, fig. 10.

Collections.—Howe Island, Greenland (1); Puget Sound, Washington (1); Yes Bay, Alaska (8).

The specimens examined grossly resemble *N. californiensis*, below, but they differ in having the proboscis proximally covered with flattened processes instead of being smooth; each process has its beak directed away from the distal papillae. Interramal cirri are first present on segment 5 or 6.

Distribution.—This is a circumpolar species in littoral zones in a sandy substratum.

Nephtys caeca (Müller)

Fauvel, 1923, pp. 365-366, fig. 142; Hartman, 1938, pp. 144-145; Hartman, 1948a, pp. 24-25.

Collections.—Southern Alaska (several); Washington (4); British Columbia, Canada (several); Oregon (1); northern California (1); Massachusetts (2); southern England (1); Scotland (1).

The proximal surface of the proboscis is strewn with wartlike processes; postsetal lamellae of parapodia are broadly foliaceous.

Distribution.—This is a cold water, circumboreal species; it seldom occurs south to California.

Nephtys discors Ehlers

Ehlers, 1868, pp. 626-629, pl. 23, figs. 39, 40; Hartman, 1938, p. 9, 1 fig.

Material examined.—Holotype specimen from Eastport, Maine, collected by A. E. Verrill, October, 1863 and deposited in the Museum of Comparative Zoology.

The original account was based on 2 lots, both from Maine; I have reexamined specimen no. 700. It is large with proportions as described by Ehlers. It grossly resembles large individuals of *N. caeca* (above) and might easily be mistaken for the latter. In it the interrampal cirri are first present from segment 6 (Ehlers said 4) and continued back to near the end of the body; they are cirriform and inscribe a recurved spiral but are nowhere large; they are best developed in the anterior third of the body and hardly visible in the posterior half, thus different from comparable ones in *N. caeca* where they continue large farther back. Parapodial lobes are as shown by Ehlers (figs. 39, 40).

Distally the proboscis has 10 pairs of bifid papillae and single mid-dorsal and midventral ones, totalling 22. Subterminally there are 22 rows with 4 to 6 in a row; they diminish in size proximally and are absent from the basal two-thirds of the proboscis; there is none distinctly median. The proximal surface is covered with low, flat, wartlike processes that diminish in size orally; nowhere is the surface smooth but the processes are less conspicuous than those in *N. caeca*.

Postacicular setae are fine, long and taper to a point; the uppermost and lowermost are nearly smooth; those along the middle of the series have delicate transverse rows of fine spinelets, with 6 to 8 points in a row. Preacicular setae are fewer and much shorter though about equally fine; they are transversely barred with individual bars wider than long and closely spaced. Acicula are pale yellow, translucent, distally blunt and straight. Furcate setae have not been identified.

N. discors may represent a local form of *N. caeca*; the sharpest differences are those in the reduced intercirri and the divergent parapodial lobes.

Distribution.—It is known only from Eastport, Maine.

Nephtys punctata Hartman

Hartman, 1938, pp. 155-156, fig. 67; Berkeley, 1942, p. 193.

Collections.—1131-40 (1); 1182-40 (4); 1183-40 (3); 1195-40 (1); 1200-40 (1); 1201-40 (4); 1226-41 (1); 1227-41 (2); 1228-41 (1); 1229-41 (1); 1237-41 (2); 1314-41 (1).

Distribution.—Originally described from southern Alaska in 483 fms, the Gulf of Georgia in 31-90 fms and central California in 68-382 fms, it is here further reported from southern California in 54 to 263 fms. Berkeley (1942) recorded it from Alaska and British Columbia, Canada.

***Nephtys rickettsi* Hartman**

Hartman, 1938, pp. 153-155, fig. 66.

Collections.—994-39 (1); 1137-40 (1); 1160-40 (2); 1192-40 (2); 1195-40 (1); 1226-41 (fragment); 1227-41 (3); 1229-41 (1); 1237-41 (1); 1267-41 (1); 1268-41 (1); 1288-41 (4); 1289-41 (1); 1299-41 (2); 1412-41 (5); Cache Bay, Alaska (1); Sitka, Alaska (1).

Distribution.—The range is here extended from Alaska south through southern California in 32 to 268 fms.

***Nephtys impressa* Baird, revised**

Plate 17, figs. 3, 4

Baird, 1873, pp. 94-95.

Material examined.—Holotype specimen from Lota, Patagonia, deposited in the British Museum of Natural History, London, England.

This species has remained unknown except through its original brief description. The type consists of a single complete, though posteriorly regenerated individual about 95 mm long. The prostomium is approximately pentagonal in shape and broader than long, the width about one and one-half times the length. The anterior margin is straight and the posterior one broadly V-shaped. There are no visible eyespots or other color markings. The protruded proboscis has 22 rows of papillae (Baird described 12 pairs, or a total of 24). The subdistal papillae are in 7 to 9 longitudinal rows; they decrease in size rapidly in passing from distal to proximal regions; there is a moderately large middorsal papilla. The proximal surface of the proboscis is smooth.

Interramal cirri are recurved (figs. 3, 4) not involute as first stated. They are first present from the fourth segment and continued back to the end of normal segments (the last 10 segments are regenerated). Parapodia are well developed throughout; setae are numerous, long, silky and flowing, but many are broken off obliquely near the base of the spinous region. Preacicular lamellae are broad, flat and entire except in anterior neuropodia where they are longer and slenderer. In about the first 25 segments the superior edge of neuropodia has a conspicuous lobe (fig. 3); farther back this lobe diminishes in size but is still visible even in posterior segments as a small, digitate process (fig. 4).

Setae are of 2 kinds including preacicular barred, and postacicular lanceolate ones. The barred ones were originally described as "minutely joined." The joints are presumed to have referred to the transverse bars, and not an articulation. Postacicular setae are long and blade-like, the outer edge delicately serrated with transverse series of spinelets. These setae are easily broken and obliquely slivered; many therefore, are broken off or remain as shattered stumps. No furcate setae have been identified. Baird described a third kind of setae as "compound, the edges of the appendage toothed as is also the top of the shaft." I am unable to find such setae or to account for the presence of compound setae in any member of the family NEPHTYIDAE; the reference may have been to the broken, partly splintered postacicular setae.

N. impressa is characterized for having superior lobes in neuropodia present in anterior and posterior segments; interrampal cirri are first present from segment 4. The subdistal papillae of the proboscis are in only 4 or 5 rows.

Distribution.—*N. impressa* is known only from Patagonia, southern South America.

Nephtys singularis, new species

Plate 15, figs. 1-6

Collections.—495-36 (1+); 770-38 (1+); 930-39 (2—).

This is a slender, prolonged species. One specimen not quite complete and with proboscis retracted, measures 33 mm long for 102 segments; greatest width is 1.8 mm at about the fifteenth segment. There is no pigment except on the prostomium where the dorsal surface is slightly diffused with dark color. The species is otherwise conspicuous for the greatly prolonged neuropodial postsetal lobes through median and posterior segments, causing the specimen to appear ragged.

The prostomium seen from above is approximately rectangular (proboscis retracted) and longer than wide; the 4 frontal antennae are subequal, with the ventroposterior pair the larger; all are simple and taper distally. Nuchal organs at the postectal margins are visible as papillae (fig. 1).

The proboscis when everted is clavate in shape; it terminates distally in 22 bifurcated papillae as typical of other species; the same number of rows is continued in the subdistal series. These are largest at the forward (everted) end and number to 7 or 8 in a longitudinal series; they diminish in size gradually going back. The proximal surface is smooth but may appear somewhat wrinkled when the proboscis is not fully everted. There is no distinct middorsal or midventral larger papilla.

The first parapodium is biramous as are all others. Its ventral cirrus is about as large as the ventral prostomial antenna; its dorsal cirrus is smaller. The first notopodial fascicle, as also those of the next 3 segments, carries a series of long, backwardly directed barred preacicular setae that far surpass the postacicular setae in their respective segments; those in the third and fourth segments are the most numerous and longest; thereafter these preacicular setae diminish in importance.

Interramal cirri are first present from the fourth segment, where they are already large and far surpass the notopodial lobes in size. They are clearly recurved and inscribe part of a spiral, already from the first. These cirri are present through a long median region but absent from some posterior segments.

A superior neuropodial lobe is present from the fourth segment; it is short at first but rapidly longer so that by the fifth it is conspicuous (fig. 2) and continues so to the twelfth segment after which it diminishes to absence before the thirtieth segment. It is not visible on median segments.

Notopodia have a large, foliaceous postsetal lobe, a slender, prolonged notopodial lobe, a short, broadly rounded acicular lobe in anterior segments that comes to be slightly equally bifid in median and posterior segments. The single, yellow aciculum projects more or less as a bluntly rounded straight rod. Notopodia of median and more posterior segments tend to have a larger, broader, postsetal lobe and the presetal part is correspondingly enlarged, but the differences are not marked.

Anterior neuropodia have similarly a large foliaceous postsetal lobe that resembles its corresponding one in notopodia. At its superior edge the digitate lobe is conspicuous only through about 12 segments; thereafter the postsetal portion comes to be very long, thin, extending distally nearly as far as the postacicular setae. The ventral cirrus is clavate throughout, largest in median segments; it is occasionally, though perhaps abnormally, bifurcated.

Preacicular setae are transversely barred. Those of the first 4 segments are more conspicuous, coarser and longer than are the corresponding postacicular setae. After the fourth segment they diminish in thickness and size so as to be surpassed by the postacicular setae. The transverse ridges of the barred setae are close (figs. 5, 6).

Postacicular setae are flowing and arranged in fanshaped fascicles, accompanied by single, straight yellow acicula. They are cylindrical in their embedded basal portion; where they emerge from the fleshy parapodium the stem is abruptly and obliquely thinner, appearing frac-

tured (fig. 4); the blade is thin and knifelike, provided with a single series of teeth or bracts that extend along the broad portion of the seta but diminish to disappearance at the distal third; the tapering, distal tip is smooth. Furcate setae have not been found.

N. singularis is characterized especially for its long, thin, foliaceous postsetal lobes in median and posterior segments, and the digitate superior neuropodial lobes of segments 4 to 12; interramal cirri are present from segment 4 where they are already large and continued back through a long region. The prostomium lacks eyespots. The proboscis has 22 rows of terminal papillae, and 22 rows of proximal papillae with 7 to 8 in a series; the proximal surface is smooth; there is no middorsal or midventral one. The species is separable from related ones, as indicated in the key above.

Holotype.—from station 770—38 and paratypes in the Allan Hancock Foundation.

Type locality.—Off San José Point, Guatemala in 7-11 fms, black sand.

Distribution.—Near Cabeza Ballena, Gulf of California in 10-15 fms and off Guatemala in 7-13 fms, in fine sand.

Nephtys magellanica Augener

N. incisa Treadwell, 1914, p. 193.

N. malmgreni Treadwell, 1914, p. 192, in part.

N. assimilis Treadwell, 1914, p. 193, in part.

Hartman, 1940, p. 238, pl. 41, figs. 100, 101; Hartman, 1944b, p. 18.

Collections not previously reported.—559-36 (1); 1051-40 (1); 1056-40 (1); 1070-40 (1); 1075-40 (4); 1080-40 (1); 1757-49 (1); San Lorenzo Channel, Espiritu Santo Island, Lower California (several); San Pedro, California (12); La Playa, San Diego Bay, and other localities nearby, California (22).

The following collections reported from parts of southern California have been reexamined and are here referred to *Nephtys magellanica*. They are now in the Allan Hancock Foundation: *Nephtys malmgreni* Treadwell (1914, p. 192) from Point Loma, La Playa in San Diego Bay, San Pedro Channel, San Pedro, San Diego; also the following dredged stations from southern California, XLI-H 1 to 5 and LXXVI-H 1 (for data consult Michael and McEwen, 1915). Others reported as *N. assimilis* Treadwell (1914, p. 193) come from stations LXXXIX-H 1 and LXXV, and as *N. incisa* Treadwell (1914, p. 193) off La Jolla, California.

Distribution.—*N. magellanica* is known in the Eastern Pacific Ocean from southern California to the Strait of Magellan; it occurs also in West Indian seas and Colombia and Venezuela. Its bathymetric range is from low intertidal to 75 fms.

Nephtys panamensis Monro

Hartman, 1940, pp. 239-240, pl. 41, fig. 105, pl. 42, figs. 106-109.

Collections not previously reported.—667-37 (1); 936-39 (1); 945-39 (1); 1088-40 (2).

The proboscis usually has only 3 longitudinal rows of papillae (Monro, 1928, pp. 81-82, figs. 3-4). A specimen from station 667-37 has 6 to 8 rows but it agrees with the others in having a very long median papilla.

Distribution.—This occurs on the Pacific side of Panama, Costa Rica and the Gulf of California, Mexico, in intertidal zones to 50 fms.

Nephtys hombergi Audouin and Edwards

Plate 17, fig. 2

Nephtys macandrewi Baird, 1873, p. 94.

Fauvel, 1923, p. 367, fig. 143.

Material examined.—Holotype specimen of *Nephtys macandrewi* Baird, from Coruña, Spain, in the British Museum of Natural History, London, England.

The everted proboscis has 22 rows of papillae distally and there is a distinct middorsal one subdistally; the proximal surface is smooth. Interramal cirri are recurved, first present from the fifth segment where they are already large; they are continued back nearly to the end of the body. The last 10 or more segments are regenerated in this individual. The preacicular notopodial lobe is broadly incised (fig. 2) and acicular lobes have a digitate elongation. Neuropodia have expansive oblique postsetal lamellae. In all of these respects the specimen agrees with *N. hombergi* Audouin and Edwards (see Fauvel, 1923, p. 367).

Distribution.—This is known from western and southern Europe.

Nephtys caecoides Hartman

N. coeca, *N. malmgreni* and *N. assimilis* Treadwell, 1914, pp. 192-193, in part.

N. assimilis Berkeley, 1924, p. 290.

Hartman, 1940, pp. 240-241; Hartman, 1944c, p. 250; Berkeley, 1945, pp. 326-327.

Collections not previously reported.—927-39 (1); 976-39 (3); 979-39 (1); 987-39 (2); 990-39 (11 anterior ends); 995-39 (9); 1003-39 (2); 1030-40 (3); 1081-40 (1); 1120-40 (7); 1126-40 (6); 1130-40 (6); 1131-40 (2); 1134-40 (1); 1138-40 (1); 1141-40 (1); 1142-40 (4); 1143-40 (8); 1151-40 (1); 1165-40 (1); 1169-40 (1); 1181-40 (1); 1197-40 (6); 1202-40 (2); 1203-40 (1); 1204-40 (4); 1205-40 (8); 1211-40 (11); 1219-40 (5); 1232-41 (4); 1235-41 (2); 1238-41 (1); 1249-41 (1); 1257-41 (2); 1261-41 (1); 1274-41 (1); 1275-41 (1); 1278-41 (1); 1282-41 (1); 1284-41 (7); 1293-41 (1); 1295-41 (13); 1320-41 (1); 1332-41 (2); 1335-41 (5); 1358-41 (1); 1359-41 (1); 1364-41 (1); 1372-41 (2); 1384-41 (3); 1413-41 (2); 1441-41 (4); 1442-41 (3); 1445-42 (1); 1449-41 (1); 1450-42 (2); 1451-42 (8); 1457-42 (4); 1472-42 (11); 1494-42 (1); 1496-42 (1); 1500-42 (3); 1502-42 (1); 1505-43 (4); 1582-47 (10); 1694-49 (3); 1871-49 (1); 1902-49 (2); many others come from areas of Lower California, Mexico, north to British Columbia, Canada.

Collections reported as *N. assimilis* Treadwell (1914, p. 193) now deposited in the Allan Hancock Foundation, have been reexamined and are here referred to *N. caecoides*: from west Berkeley (1), Santa Barbara (1), San Pedro (1), Ballast Point in San Diego Bay (2), station XIII off San Pedro in 35-36 fms (1), all from California; also, reported as *N. malmgreni* Treadwell (1914, p. 192) from San Pedro (1); and another reported as *N. coeca* Treadwell (1914, p. 192) from Humbolt Bay, northern California.

Distribution.—*N. caecoides* occurs in littoral zones of the temperate northeast Pacific, south to Lower California, Mexico; it is especially common in muddy sands of bays and lagoons, where it forms beds.

***Nephtys ferruginea* Hartman**

N. malmgreni Treadwell, 1914, p. 192, in part.

Nephtys caecoides ferruginea Hartman, 1940, p. 241, pl. 42, figs. 110-114, pl. 43, fig. 115.

Berkeley, 1945, pp. 327-328.

Collections not previously reported.—992-39 (1); 1032-40 (9); 1133-40 (1); 1220-40 (8); 1226-40 (1); 1251-41 (1); 1289-41 (6); 1290-41 (2); 1300-41 (5); 1386-41 (1); 1387-41 (6); 1390-41 (12); 1392-41 (1); 1396-41 (2); 1411-41 (1); 1435-41 (2); 1436-41 (2); 1471-42 (12); 1472-42 (4); 1622-48 (1); 1703-49 (1); 1787-49 (2); Ballast Point in San Diego Bay, dredged (1); Ruxton Channel, Nanaimo, British Columbia, Canada (1, gift from Dr. C. Berkeley).

A collection reported as *N. malmgreni* Treadwell (1914, p. 192) from Ballast Point, has been reexamined and is referred to this species. Berkeley (1945, p. 327) raised this from subspecific to specific rank.

Distribution.—*N. ferruginea* is known from British Columbia, Canada south to Peru in depths of 10 to 230 fms; it is taken from soft mud or clay substrata.

Nephtys californiensis Hartman

Hartman, 1938, pp. 150-151, fig. 64; Hartman, 1940, p. 240; Hartman, 1944c, p. 251.

Collections not previously reported.— 1459-42 (2); 1597-47 (1); 1620-48 (1); 1759-49 (1); 1882-49 (1); 1886-49 (1); Dillon Beach and Bodega Head, Marin County, California (about 25); outer beaches at San Francisco, California (2).

Most of these specimens show the characteristic "spread eagle" pattern of the prostomium (Hartman, 1938, fig. 64) but there is some variation in the first occurrence of interramal cirri. In some (1597-47 and 1759-49) it is first present from segment 3, in others (1620-48, 1882-49 and 1886-49) it is first present from segment 4. The specimen from 1587-47 is further different for having, in addition to the prostomial pattern, a broad transverse dark stripe on some posterior segments.

Distribution.—This occupies shifting intertidal sands of central California, south to the Gulf of Mexico; it seldom occurs to 30 fms. In its southern range it seems to intergrade (or hybridize?) with *N. caecoides*, above, so that individuals of the 2 species are sometimes not clearly distinguishable.

Nephtys picta Ehlers

Nephtys picta Ehlers, 1868, pp. 632-635, pl. 23, fig. 9, 35; Hartman, 1938, p. 9; Hartman, 1945, pp. 22-23.

Collections.—Cape Lookout, North Carolina (4); Grand Isle, Louisiana (2, gift from Dr. E. H. Behre); Beaufort, North Carolina (6).

Total length approaches 85 to 150-200 mm. The anterior dorsum is marked with dark transverse bars segmentally arranged. The prostomium is approximately pentagonal seen from above; its anterior margin is straight and broadest, with a thin, spatulate edge; the anterior or frontal antennae are prolongations of the anterior lateral edges. The posterior

antennae are easily overlooked; they are much smaller and inserted far back at the posterolateral margin of the prostomium, near the origin of the first neuropodium. There are no visible eyespots. Nuchal organs are located at the postectal margins of the prostomium.

The proboscis (everted) has 20 terminal bifid papillae, the 10 of each side separated from each other by a middorsal and midventral low papilla. The subterminal papillae are in 22 rows with 3 to 5 longitudinal, though irregular rows, the largest are distal and they decrease rapidly in size proximally. There is a much larger middorsal one. The proximal surface of the proboscis is smooth. The jaws (seen by dissection) are broad, triangular, amber colored with darker tips.

The first parapodium is directed forward at the sides of the prostomium. Its neuropodium is much larger than its notopodium. The former is in front of, and below the latter and projects far forward so as to be at the sides of the prostomium. Its acicular lobe carries 10 or more long, slender preacicular setae (there are no postacicular setae) arranged in a crescent about the aciculum. The neuropodium is enlarged as a broad, flat lobe that is continuous with a digitate ventral cirrus. The first notopodium is above and somewhat behind the neuropodium; it is a low acicular cone lacking cirri but with a crescentic preacicular fascicle of about 20 setae and a much weaker postacicular series of 7 delicate setae. Other parapodia are lateral in position and normal in their parts. The second through fourth segments have preacicular fascicles that exceed in size and length the postacicular fascicles. Thereafter the postacicular setae come to be the more conspicuous ones.

Interramal cirri are first present from the fourth segment and continued back to near the end; the last 4 or 5 segments lack them. These cirri are recurved, inscribing nearly a circle where best developed; they are tapering and visibly ciliated at the margins.

Acicular lobes in anterior parapodia are broad and short, with a slight incision at the place where the aciculum emerges. Those in middle segments are much broader and also slightly incised where the aciculum emerges. In posterior segments the neuroacicular lobe comes to be more prolonged at its end than the comparable notoacicular lobe; both are conical where the aciculum emerges. Setae appear dusky in mass but are pale yellow seen individually. Preacicular setae are barred and distally pointed. Postacicular setae are of 2 kinds; most are long, slender and appear smooth along the cutting edge. A few in the middle of the series differ in having, at the widest part, near the base of the cutting edge, 5 to 7 prolonged, pointed teeth, so large as to be visible even under moderately low magnification.

The specimens listed above agree in these respects, except for 6 smaller ones, from protected sandy beaches at Beaufort, North Carolina. In these the interrampal cirri are first present from the third, instead of fourth segment. They are referred to *N. picta* especially because the postacicular setae include some with the characteristic large denticles.

Distribution.—This species occurs along intertidal shores of eastern United States from New England to Florida and in the Gulf of Mexico; it is associated with a substratum of shifting sands.

Nephtys buccera Ehlers

Nephtys buccera Ehlers, 1868, pp. 617-619, pl. 23, fig. 8.

Material examined.—Type specimen of *Nephtys buccera* Ehlers, no. 209 in the Museum of Comparative Zoology, Cambridge, Massachusetts.

Except for its pale color, this so closely resembles *Nephtys picta* (above) that it is at first separable with difficulty. McIntosh (1900b, p. 266) had considered the 2 identical but this view was challenged (Hartman, 1945, p. 23).

The prostomium is approximately rectangular, with the frontal margin widest and spatulate; the anterior antennae are prolongations of the anteroectal margins and project obliquely forward. The posterior antennae are easily overlooked since they are far back and lie under the prostomium; they are inserted in the crotch where the prostomial lobe and first neuropodium join.

The proboscis has 20 terminal bifid papillae, the 10 of a side separated from each other by middorsal and midventral papillae. There are 22 rows of subterminal papillae with 6 to 8 in a row, but in irregular arrangement. A very long middorsal one extends forward from the most distal row. The proximal surface of the proboscis is smooth. Within there are 2 dark brown triangular jaws.

The first parapodium resembles very nearly that in *Nephtys picta* (above). The neuropodium is enlarged as a broad, flat lobe and continuous with a digitate ventral cirrus; it carries a fascicle of slender preacicular setae that project forward at the sides of the prostomium; the notopodium consists of an acicular lobe only with a crescentic fascicle of preacicular setae and a few postacicular setae. Acicular lobes are broadly rounded in anterior and median segments and come to be more or less conical in back.

Interrampal cirri are first present from the fourth segment and recurved from the fifth; they are present through most body segments,

the last 5 segments lack them, but on the eighth last segment there is a recurved cirrus, followed by 2 segments where only a blunt base is visible.

The notopodial cirrus is unique for having a basal flattened lobe which abruptly gives rise to the digitate cirrus; in this respect it differs from the comparable part in *Nephtys picta*, where the basal part of the notopodial cirrus is not so broadly expanded.

Preacicular setae are barred and terminate in slender tips, as typical of other species. Postacicular setae are of 2 kinds; most are long, slender, and smooth along the cutting edge. A few in the middle parts of the fascicles have, at the lower part of the cutting edge, a few tooth-like processes that resemble those of *N. picta* (above) but are shorter, more easily sloughed off, and apparently constricted at the base.

Nephtys bucera may be separable from *N. picta* in the following respects: the jaw pieces are dark brown in the first and amber colored in the second; acicular lobes are rounded to conical in the first and slightly incised in the second; the notopodial cirrus has a basal broad lobe in the first which is larger than that in the second. In *N. picta* the toothed postacicular setae are coarsely and conspicuously dentate at the basal end whereas in *N. bucera* the larger denticles are dehiscent.

N. picta has dark transverse bars on the first few to 40 segments; *N. bucera* lacks color pattern and is pale except for the red color caused by the blood vessels.

Distribution.—*N. bucera* Ehlers is known chiefly from New England, and has been recorded south to North Carolina.

Nephtys cornuta Berkeley

Nephtys cornuta Berkeley, 1945, p. 328.

Collection.—Friday Harbor, Washington (1, gift from Drs. E. and C. Berkeley).

This is a pale, small species. An ovigerous, presumably grown individual measures only 10.8 mm long and 2 mm wide with, 1 mm without, parapodia at the widest or tenth segment. The ventral prostomial antennae are deeply bifurcated. Interramal cirri are first present from segment 5 and already large; they are continued back to near the end of the body. The proboscis, seen only by dissection, terminates in large papillae and the proximal surface is seemingly smooth; jaw pieces are triangular, light brown, paired.

The prostomium lacks eyespots; it is approximately rectangular seen from above. Nuchal organs are inconspicuous at the postectal margin of the prostomium. The first parapodia are smaller than the others and directed forward at the sides of the prostomium. Notopodial cirri are typically small and bulbous with a distal filament. Ventral cirri are small and inconspicuous throughout, inserted near the notopodial base and thus far surpassed by the long ramus. Acicular lobes are long, cylindrical and bluntly conical at the free ends. Preacicular setae are barred and present in anterior segments where they are as large as, or more conspicuous than the accompanying postacicular setae. Farther back they gradually diminish in size and are absent from segments in the posterior half of the body. Postacicular setae are smooth or very delicately toothed at the edge. Furcate setae have not been identified.

Distribution.—*N. cornuta* is known only from Friday Harbor, Washington and southwestern Canada, to 20 fms (Berkeley).

***Nephtys monroi*, new name**

Plate 17, fig. 1

Monro, 1933a, pp. 53-55, fig. 23h.

Material examined.—A specimen labelled *Nephtys tabogensis* Monro, from Taboga, Panama, in the British Museum, London, England.

This species is partly described but not named by Monro (1933a, p. 53) as *Nephtys tabogensis* (see also *Aglaophamus*, below). A single large, mature male individual measures 63 mm long and 3 mm wide without parapodia. It consists of 67 segments and has a posterior regenerating end. Interramal cirri are recurved, not involute as are those in *Aglaophamus tabogensis* (Monro); thus the 2 individuals used in the original description (Monro, 1933a) are not the same but belong to different genera.

The prostomium is much longer than wide. Anterior notopodial lamellae are broad and slightly incised; this notch disappears in middle and posterior segments. Interramal cirri are first present from the eighth segment and continued back at least through segment 67; they decrease somewhat in size after about segment 50. Notopodial cirri are short and foliaceous; they do not elongate in any part of the body. Anterior notopodia have a short, broad, slightly incised anterior presetal lamella, a conical acicular lobe and a longer, broad, rounded postsetal lamella. The notopodial cirrus is short and foliaceous; it has an acute tip. In median and posterior segments the shallow incision of anterior lamellae disappears and this part comes to be broadly rounded. Neuropodia are

chiefly characterized for having a long, erect lobe at the superior edge (fig. 1); this is first visible at about segment 18 as a tongue-like process at the upper end of the setal fascicle; it continues farther back to about segment 60 and is absent thereafter. The presetal lobe is short, the acicular lobe is conical and the postsetal lobe is longer, broader and lamellar. Preacicular setae are barred; postacicular setae are delicately toothed. Furcate setae are believed absent. The proboscis remains unknown.

Distribution.—*N. monroi* is known only from Taboga Island, Pacific side of Panama in 6-12 fms on a muddy bottom.

Nephtys incisa Malmgren

Fauvel, 1923, pp. 369-370, fig. 144: *Not* Treadwell, 1914, p. 193.

Collections.—Gullmar Fjord, Sweden (several); Plymouth, England (1).

Specimens from southern California reported as *N. incisa* (Treadwell, 1914, p. 193) go to *N. magellanica* (above). I know of no other record of its occurrence in the eastern Pacific. It is recorded, however, from eastern America (Sumner, et al, 1913, p. 619).

Distribution.—Eastern United States and western Europe.

Nephtys phyllocirra Ehlers

Nephtys phyllocirra Ehlers, 1887, pp. 131-134, pl. 38, figs. 7-11; Augener, 1918, pp. 164-165.

Material examined.—Type specimen no. 62 in the Museum of Comparative Zoology, Cambridge, Massachusetts.

The single specimen is posteriorly incomplete and has the proboscis retracted and not dissected; it measures 31 mm long for 46 segments, 4.0 mm wide with and 2.1 mm without parapodia at the widest part or eighth segment. The specimen is now so hardened and brittle that the parts of the proboscis cannot be distinguished; also, the setae are broken off and the fleshy parapodial lobes have been rubbed away so that these parts cannot be discerned. Heavy yellow acicula project from the conical acicular lobes for a considerable distance, but perhaps abnormally since they were not first described.

The prostomium is small, pale and lacks eyespots. The proboscidial jaws are black, blunt, triangular pieces. According to Ehlers, the terminal papillae number 22 bifid ones and there are 22 rows subterminally. Interramal cirri are first present from the sixth, and much larger on the seventh segment. They are weakly recurved or directed ventrally,

and continued on successive segments to the end of the piece. Notopodial postsetal lobes are foliaceous and broad (Augener, 1918, p. 165); acicular lobes are conical.

Postacicular setae are long, smooth, pale. Preacicular setae are barred as characteristic of other species. They were first thought (Ehlers, 1887) to be lacking from neuropodia; however, they are present, most conspicuous in anterior segments and diminish thereafter to only a few in a segment. They thus resemble the ones in notopodia.

This species seems to have its nearest affinities with *N. incisa* Malmgren, from which it is distinguished through the presence of the foliaceous notopodial lobes.

Distribution.—This is recorded off southern Florida in 320-339 fms (Ehlers, 1887, p. 131), off the West Indies in 44-197 fms (Augener, 1906, p. 154), off Delaware in over 600 fms (Treadwell, 1928, p. 466) and off Colombia, Atlantic side in 6 meters (Augener, 1933a, p. 209).

Nephtys glabra, new species

Plate 13, figs. 1-9

N. malmgreni Treadwell, 1914, p. 192, in part. *Not* Théel, 1879.

Collections.—890-38 (1); 1229-41 (1); 1268-41 (1); 1376-41 (1); 1384-41 (1); 1413-41 (1); middle ground in San Diego Bay, California (2, collected by William Morton Wheeler).

Total length exceeds 115 mm (posteriorly incomplete); number of segments is over 120. The prostomium is trapezoidal in shape, the anterior end only slightly wider than the posterior one; it is longer than wide unless the proboscis is everted when it appears wider than long (fig. 1). There are no color spots on preserved individuals.

The proboscis has 22 bifid, terminal papillae. The subterminal ones are arranged in 22 longitudinal rows and each row has few (one to 3), the largest one distal and the greatest number at the sides of the proboscis. In addition, there is a large, conspicuous middorsal one that exceeds the others in size. The proximal surface of the proboscis is smooth and glistening.

Interramal cirri are recurved and first present from the sixth or seventh segment; they are small through segments 10 to 16, and continued back nearly to the end of the body. The first 10 or more segments have parapodial rami widely separated, exposing a considerable area of the interramal space (fig. 2); farther back the rami are less widely separated.

Parapodial lobes are lamellar but not prolonged. The presetal lobes are short and broad, postsetal ones are longer but only slightly or not at all surpassing the acicular lobe. The latter is broadly rounded (fig. 3) with acicula projecting only slightly.

Setae are long and flowing; they appear dusky in mass against the pale body. Preacicular setae (figs. 6 and 9) are barred and much the shorter except in anterior segments, where they are longer, stronger and coarser than their corresponding postacicular setae. After the origin of the interramal cirrus the barred setae are rapidly smaller and more slender than postacicular setae. The distal free part of postacicular setae is flattened and delicately serrated at the outer edge (figs. 4, 5). The ornamentation is most developed on setae in inferior and superior positions of the fascicle.

N. glabra is characterized for having interramal cirri first present from segment 6 or 7 and then not well developed until about segment 16. The proboscis has only 2 or 3 papillae in a row in the subterminal series, and the middorsal one is very conspicuous. Parapodial lamellae are weakly developed throughout; acicular lobes are broadly rounded.

Specimens reported as *N. malmgreni* Treadwell (1914, p. 192) from San Diego Bay, California, have been reexamined and are here referred to *N. glabra*.

Holotype from station 1268-41 and paratypes in the Allan Hancock Foundation.

Type locality.—Off Anacapa Island light, California in 48-51 fms (station 1268-41).

Distribution.—Off Point Piños, Monterey, California south to San Diego Bay, California; subintertidal to 108-109 fms, in gray or greenish sand.

Nephtys squamosa Ehlers

Hartman, 1940, pp. 237-238, pl. 41, figs. 98, 99; Hartman, 1944b, p. 18.

N. assimilis Hartman, 1940, p. 239, pl. 39, figs. 87-88. *Not* Oersted, 1843.

Collections not previously reported.—495-36 (1); 770-38 (2); 913-39 (6); 941-39 (1); 1002-39 (2); 1008-39 (3); 1010-39 (3); 1012-39 (2); 1024-39 (2); 1056-40 (1); 1081-40 (1); 1106-40 (1); 1119-40 (1); 1137-40 (1); 1191-40 (1); 1251-41 (2); 1259-41 (1); 1260-41 (4); 1326-41 (1); 1328-41 (10); 1358-41 (1); 1390-41 (2); 1754-49 (1); 1758-49 (1).

Interramal cirri are first present from segment 4. This species is chiefly characterized for the strongly imbricated superior lamellae of notopodia. In this respect it resembles *N. imbricata* Grube (1856, p. 168) from Valparaiso, Chile, but the latter is too incompletely known for certain identification.

Three small, presumably juvenile individuals earlier reported as *N. assimilis* (Hartman, 1940, p. 239) from stations 495-36 and 770-38, are referred to *N. squamosa*, although the parapodial lobes are not imbricated as is typical for adult or larger specimens. Other characters, notably the early origin and large size of interramal cirri and the setal structures are those of *N. squamosa*.

Distribution.—This occurs on both sides of tropical America and tropical west Africa; it is subintertidal to 120 fms.

Nephtys paradoxa Malm

Fauvel, 1923, p. 375, fig. 146.

Collection.—Gullmar Fjord, Sweden, dredged (1).

Interramal cirri are first present from segment 8 to 10; they are minute at first but gradually increase in size and come to be large and foliaceous; on the last 25 to 30 segments they are again small or nearly absent. Postacicular setae are more distinctly toothed at the cutting edge than are similar ones in *N. phyllobranchia* (below) with which this is nearly allied, if not actually identical. Furcate setae are believed to be absent.

The single specimen in the collections was a gift from Dr. Gunnar Gustafson, to whom thanks are extended.

Distribution.—North Atlantic Ocean in moderate to shallow depths.

Nephtys phyllobranchia McIntosh

Hartman, 1942b, p. 99.

Collection.—Off Delaware in 1105 fms (1).

The prostomium lacks eyespots. Nuchal organs are moderately conspicuous. The proboscis has 22 rows of papillae distally and as many subterminally; there is none distinctly middorsal. The proximal surface is smooth. Interramal cirri are first present though very small, from about segment 13; they increase in size gradually and are large, strongly foliaceous by segment 35. They decrease in size thereafter so that by segment 40 or somewhat later they are absent. Postacicular setae are faintly serrated at the cutting edge. Furcate setae have not been identified.

This species is separable from *N. paradoxa* (above) for only slight differences; if they are found to be identical, *N. paradoxa* Malm has priority.

Distribution.—*N. phyllobranchia* has been reported only from deep water (1240 fms) off New York and off Delaware in 1105 fms.

***Nephtys assignis*, new species**

Plate 14, figs. 1-6

Collections.—890-38 (1); 1220-42 (2); 1237-41 (2); 1379-41 (2); 1384-41 (1).

This species grossly resembles *N. hombergi* Audouin and Edwards (above) in having broad, foliaceous postsetal lobes, but it differs in other respects. A large anterior end of 45 segments measures nearly 60 mm long and 10 mm wide without parapodia at segment 23. The prostomium is subquadrangular in shape and lacks eyespots (fig. 2). The 2 pairs of antennae are simple, cirriform, with the ventral pair the larger. Nuchal organs are eversible mounds located within the bases of the first pair of parapodia, at the postectal margins of the prostomium.

The proboscis has 22 rows of papillae; those distal are bifid as are those of other species, with the outer branch more than twice as large as the inner one. The subdistal papillae number 4 or 5 in a row; the largest ones are distal and they decrease in size proximally. None is distinctly middorsal or midventral (fig. 1). The proximal surface of the proboscis is smooth.

Interramal cirri are present from the sixth segment but are short and thick through 12 to 15 or 20 segments (later in larger individuals) after which they are moderately large; all are recurved and cirriform. They are continued back to near the end of the body; the last few segments lack them.

The first parapodium is clearly biramous with the branches widely separated; it differs from the second and successive parapodia in that it is directed forward at the sides of the prostomium. Its notopodium is much larger than its neuropodium, and it has a thick, prolonged conical notopodial cirrus, similar to that of the second segment but longer. The notopodial postsetal lobe is visible as a low papillae just above the acicular tip. Preacicular barred setae are conspicuous, number 25 or more and are arranged in a crescentic series, partially surrounding the moundlike acicular lobe. The much shorter, inconspicuous post-acicular series of lanceolate setae is continuous to form a shallow concavity at the posterior edge of the acicular lobe. The preacicular setae

appear dusky in mass, the postacicular ones nearly colorless. The predominance of these preacicular setae is observed through the first 4 segments but thereafter the postacicular setae increases in size so as to be the major ones. By segment 12 the preacicular series is far surpassed by the postacicular one.

The first neuropodium is a short lobe with a long ventral cirrus similar to the respective notopodial cirrus but only about two-thirds as large. It compares in size and shape with the ventral prostomial antennae. Its preacicular and postacicular setae are arranged in an oval series around the short conical acicular lobe; the 2 series are about equal in number and prominence, but the entire fascicle is much weaker than the corresponding notopodial one.

The second neuropodium resembles that of more posterior segments; its preacicular setae form a conspicuous anterior row of about 26 setae, its postacicular series comprises about as many but the setae are much finer and delicate. By segment 7 to 8 the postacicular series is the more conspicuous.

In typical parapodia the notopodial acicular lobe is incised (figs. 3, 4), not excavate as in *N. hombergi* (above). Acicula occur singly in parapodia; they are yellow but look dark when observed from the tip. They are distally straight and only slightly project from the parapodium when not retracted. Postsetal lobes are broad and foliaceous; the notopodial is much smaller than the neuropodial one (fig. 4). Setae are directed laterally in sparse fascicles. Preacicular setae form transverse series in front; they diminish in size and number farther back. In median and posterior segments they are inconspicuous when compared with the postacicular setae. Like those in front, they are transversely barred (fig. 5). Postacicular setae are transversely serrated at their widest part (fig. 6).

N. assignis is characterized in having a proboscis with only 4 or 5 distal rows of papillae and smooth proximal surface; interramal cirri are first present from segment 6 and small for 12 to 20 segments. The conspicuous development of preacicular setae continues through a few anterior segments. The notopodial lobe is incised, the neuropodial one is rounded. Postsetal lobes are broadly foliaceous. *N. assignis* is distinguished from other species in the key above.

Holotype from station 1379-41 and paratypes in the Allan Hancock Foundation.

Type locality.—Santa Catalina Channel, California in 84-95 fms.

Distribution.—California and Lower California, Mexico, from Monterey Bay south to Cedros Island in 36-109 fms; also off San José Light, Guatemala in 2-5 fms, sand and mud.

***Nephtys acrochaeta*, new species**

Plate 16, figs. 1-6

Material examined.—Holotype specimen from off Uruguay, South America, Swedish State Museum, Stockholm, Sweden.

A single specimen, posteriorly not quite complete, consists of 58 segments and measures 50 mm long and 1.75 mm wide without, 3 mm with parapodia at the widest region or about segment 16. The body has no color pattern but is pale tan throughout. The prostomium is quadrate, a little longer than wide (proboscis retracted); its anterior margin is straight, its sides about parallel, and the posterior margin merges imperceptibly into the first segment. The anterior frontal antennae are small, located at the anteroectal margins and continuous with the prostomium. The posterior antennae are much larger and located immediately behind and ventral to the frontal antennae; they are triangular with a broad base. Nuchal organs are conspicuous papillar processes at the postectal margins of the prostomium. There are no eyespots. The ventral folds of the lower lip are deeply longitudinally grooved so as to extend back onto the seventh segment (proboscis retracted).

The proboscis, seen by dissection, has 21 rows of bifid terminal papillae and about as many rows of subterminal papillae. There is none distinctly middorsal or midventral. The distalmost are about as large as the terminal papillae and those more proximal gradually decrease in size. Those in the 2 or 3 distalmost rows are larger than the others; they are then replaced by 14 longitudinal rows of increasingly smaller papillae in 7 to 9 rows after which they disappear. The proximal surface of the proboscis is smooth. The pharyngeal jaws are translucent light horny brown with a sharp distal tooth, a quadrate base and 4 angled ridges that extend from the tip to the base.

Interramal cirri are first present from the ninth segment as a small filament; they increase gradually in size and are recurved from segment 12 though still small and slender; maximum development is not attained until near the middle of the body where a complete spiral is inscribed (fig. 1); interramal cirri are continued back at least through 59 segments (end of the specimen).

On the dorsal and ventral sides of the body, the lateral margins of the epidermis are laterally prolonged to form scale-like folds that extend back onto the succeeding segments, thus appearing imbricated; this character is notable in *Nephtys squamosa* Ehlers (see above) but not so conspicuously developed in *N. acrochaeta*.

The first parapodia are directed forward to lie at the sides of the prostomium. Notopodial and neuropodial rami are about equal in size but the notopodial cirrus is a mere vestige whereas the ventral cirrus is large, thick, conical, resembling the ventral prostomial antenna or the ventral cirrus of the second parapodium. Setae of the first segment are directed forward; the preacicular series are fully developed; the postacicular series few, weak and delicate. Those of the notopodium are slightly longer and more numerous than those of the neuropodium. By the second segment, the postacicular fascicle has attained an importance nearly equalling that of the preacicular series. The notopodial parts are more fully developed and the rami are widely separated.

The notopodial cirrus is acutely conical from about segment 3; farther back it comes to be increasingly longer, is directed laterally as a slender, tapering filament and extends far beyond the other parapodial lobes. There is no erect or prolonged lobe on the superior edge of the neuropodium. In a typical parapodium (figs. 1 and 2) postsetal lobes of both rami are foliaceous and consist of broad lobes, the upper one slightly serrated at the edge, the lower one similar or entire. The acicular lobe is acutely conical, distally prolonged so as to extend beyond the other parapodial lobes; the aciculum may be more or less withdrawn into the fleshy lobe or slightly projecting. Posterior acicular lobes are slenderer and more prolonged than those in front, but all may be described as conical.

Setae are dusky when viewed in mass but pale when seen individually. They occur in full, flowing fascicles; the preacicular barred setae are shorter and fewer than postacicular setae (except in the first segment). The barred setae are distally pointed, proximally transversely marked with light and dark areas (figs. 3, 4). Postacicular setae are of 2 kinds; the uppermost and lowermost in each branch are largely smooth, slender, lanceolate; about 10 to 12 in the median part of fascicles differ in that they have a large spur near the base of the extended part (figs. 5, 6); the distal part is delicately spinous along the cutting edge. The specific name refers to the spurred postacicular setae.

Acicula are yellow, thick, single in rami; they taper distally to a blunt tip. They may be completely embedded or project slightly from the acutely conical acicular lobes.

N. acrochaeta approaches *N. incisa* Malmgren in having acicular lobes; it differs clearly from all known species of the genus in the characteristic spurred postacicular seta.

Holotype.—In the Swedish State Museum, Stockholm, Sweden.

Type locality.—Off Uruguay, 39° 0' S, 51° 10' W, in 80 meters, dark gray mud, taken December 12, 1901 by the Swedish Antarctic Expedition, 1901-1902.

Distribution.—Off Uruguay, South America.

Genus *Aglaophamus* Kinberg, 1866

Type *A. lyratus* Kinberg

This includes *Aglaopheme* Kinberg, 1866 and *Nephtys* Kinberg, 1866, in part (see Hartman, 1948b).

Aglaophamus differs from *Nephtys* (see above) most conspicuously for having interramal cirri involute instead of recurved. Furcate setae (pl. 18, fig. 4) are generally present. Acicular lobes tend to be acutely prolonged at the distal end and the acicula are often recurved at the tip. The proboscis may have 22 to only 14 longitudinal rows of papillae and few to many in a row; rarely these papillae are lacking (*A. inermis* Ehlers). The proximal surface of the proboscis is smooth or papillated.

The following 21 species or subspecies are believed to belong to the genus *Aglaophamus* Kinberg; most are newly referred in this report. *A. agilis* (Langerhans), 1879, p. 304, from Europe. See Fauvel, 1923, pp. 372-373.

A. dibranchis (Grube), see p. 121.

A. dicirris, new species, see p. 122.

A. erectans, new species, see p. 125.

A. inermis Ehlers, see p. 129.

A. jeffreysi (McIntosh), 1885, p. 162, from Japan, dredged.

A. juvenalis (Kinberg), 1866, p. 240, from Brazil. See Hartman, 1948b, p. 51.

A. lobophora (Hartman), see p. 129.

A. lutreus (Baird), see p. 129.

A. lyratus Kinberg, 1866, p. 240, from Bangka Strait. See Hartman, 1948b, p. 50.

A. lyrochaetus (Fauvel), 1902, pp. 72-73, from northwest Africa. See Fauvel, 1927b, pp. 528-530 for additional description.

A. macroura (Schmarda), see p. 118.

A. malmgreni (Théel), 1879, p. 26, from western Europe. See Fauvel, 1923, p. 371.

A. mirasetis (Hoagland), see p. 121.

A. peruana (Hartman), see p. 120.

A. polypharus (Schmarda), 1861, p. 89, from Chile.

A. quatrefagesi (Kinberg), 1866, p. 240, from the West Indies, See Hartman, 1948b, p. 52.

A. rubella (Michaelsen), 1879, pp. 19-24, from western Europe.

A. rubella anops, new subspecies, see p. 127.

A. sinensis (Fauvel), 1932b, pp. 536-537, from China. See Monro, 1934, pp. 363-365, for a redescription.

A. tabogensis (Monro), see p. 125.

Nephtys spiribranchis Ehlers (1918, pp. 235-236, pl. 16, figs. 5-7) from Aru Island, Dutch East Indies, may belong to the genus *Aglaophamus*. The original description is obviously in error in some important respects. Thus, furcate setae are said to be present in pre-acicular series; when such setae are present, as they often are in species of *Aglaophamus*, they are postacicular in position. The notopodial cirrus (called dorsal cirrus) is said to be absent. The first parapodium is said to be uniramous. Unique features include the following: neuropodia have a tall, erect superior lobe; the proboscis has 20 subterminal rows of papillae with to 7 in a row. The interrampal cirrus is shown recurved (Ehlers, 1918, pl. 16) but it is possible that it was unnaturally turned upward for the illustration, in which case it would actually be involute, as in *Aglaophamus*; the notopodial cirrus might thus also have been concealed, lying under the interrampal cirrus. Fauvel (1932a, p. 177) has referred this species to *A. dibranchis* (Grube), but there are some discrepancies in the descriptions.

KEY TO SPECIES OF *Aglaophamus*

1. Postsetal lobes serrated 2
1. Postsetal lobes not serrated 3
2. Proboscis with 12 rows of papillae *A. polyphara*, p.
2. Proboscis with 22 rows of papillae *A. lobophara*, p. 129
3. Proboscis without terminal or subterminal papillae; notopodial and ventral cirri very long and slender *A. inermis*, p. 129
3. Proboscis with terminal and subterminal papillae; notopodial and ventral cirri usually much shorter 4
4. Notopodial cirri foliaceous and compressed 5
4. Notopodial cirri slender and cirriform 8
5. Neuropodia with an erect lobe (pl. 19, fig. 3) on the upper edge 6
5. Neuropodia without an erect lobe on the upper edge 7
6. Interrampal cirri present from second segment *A. sinensis*, p. 117
6. Interrampal cirri present from fifth segment *A. lutreus*, p. 129
6. Origin of interrampal cirri not known *A. mirasetis*, p. 121

7. Notopodial postsetal lamella entire *A. peruana*, p. 120
7. Notopodial postsetal lamella bifid *A. macroura*, p. 118
8. Postsetal lamellae inconspicuous or absent behind the middle of the body; notopodial cirri long, surpassing the interrhamal cirri at about segment 25 *A. tabogensis*, p. 125
8. Postsetal lamellae developed farther back; notopodial cirri long or short in anterior and median segments 9
9. Proboscis with 14 longitudinal rows of subterminal papillae 10
9. Proboscis with 16 rows of subterminal papillae
. *A. juvenalis*, p. 116
9. Proboscis with 22 rows of subterminal papillae *A. dicirris*, p. 122
10. Prostomium with a pair of conspicuous dark eyespots near its posterior margin (absent in *A. rubella anops*) 13
10. Prostomium without such eyespots or these doubtfully present 11
11. Interrhamal cirri present from segment 5 . . *A. lyrochaetus*, p. 116
11. Interrhamal cirri present from segment 9 12
11. Interrhamal cirri not present before segment 18 *A. lyratus*, p. 116
12. Median segments with an erect lobe on neuropodia (pl. 19, fig. 3) *A. erectans*, p. 125
12. Median segments without such erect lobe on neuropodia
. *A. malmgreni*, p. 116
13. Proboscis more or less completely covered by longitudinal rows of large papillae; middorsal papilla absent 14
13. Proboscis not so completely covered with rows of papillae; middorsal papilla present *A. dibranchis*, p. 121
14. Without prostomial eyes *A. rubella anops*, p. 127
14. With prostomial eyes *A. rubella*, p. 127

Aglaophamus macroura (Schmarda)

Nephtys macroura Schmarda, 1861, p. 91, figs.; Hartman, 1942a, pp. 113-114 fig. 9; Hartman, 1944c, p. 339, pl. 47, fig. 11.

Nephtys macrura Fauvel, 1916, pp. 436-438, pl. 8, figs. 1-3.

Hartman, 1948b, p. 10.

Material examined.—Many individuals from southern South America, collected by the Swedish Antarctic Expedition, 1901-1902.

This species was originally very briefly described as *Nephtys macroura* Schmarda (1861) from littoral sands at Auckland, New Zealand. It has since been recorded from circummundane antipodal

regions, from shore to 1200 fms (Benham, 1915, pp. 203-205). To it have been referred *Nephtys praetiosa* Kinberg, 1866, from off the mouth of the La Plata River, *N. virginis* Kinberg, 1866, from southern South America, *N. circinnata* Verrill, 1876, from Maine and *N. trisophyllus* Grube, 1878, from the Kerguelen Islands. It has been more extensively reported from the entire Antarctic realm (see Monro, 1936, p. 140). It should be noted, however, that differences, perhaps of significance, have been described (Benham, 1915, pp. 203-205).

In the individuals examined, size in length ranges from 25 to over 150 mm. A total length of 220 mm has been recorded (McIntosh, 1885, p. 161). The prostomium is subquadrate, depressed, but not spatulate in front. There are no visible eyespots. The proboscis (everted in some individuals) terminates in 20 bifid papillae and a shorter, middorsal and midventral triangular process. The subterminal papillae are in 22 rows with 2 or 3 longer papillae in a row; these abruptly give rise to 14 longitudinal rows of smaller ones, with to 5 in a row, and more proximally these divide into 2 or 3 tiny papillae each. The basal or proximal part of the proboscis is smooth.

The first parapodium is smaller than the others; it is clearly biramous with a larger neuropodium directed forward and under the notopodium. The ventral cirrus is flattened and distally prolonged as a slender tip. Preacicular fascicles in both notopodia and neuropodia are much larger than the corresponding postacicular fascicles; farther back the barred setae come to be increasingly less conspicuous. The first notopodium is merely a rounded prominence, lacking cirri or lobes.

Interramal cirri are first present from the third, or not until the fourth and very small at first, through 8-10 segments; by segment 21 they come to fill the interramal space. They diminish rapidly after the middle of the body but continue farther back as a slender, small involute cirrus to the last few body segments. Its attached notopodial cirrus is broadly foliaceous and extends distally as a slender, inconspicuous filament.

Postsetal lobes in both notopodia and neuropodia come to be large and conspicuous through the anterior half of the body; the notopodial one is incised. The acicular lobe is prolonged at one end (inferior in notopodia and superior in neuropodia) as an auricular process toward which the recurved acicula extend. The notoaciculum is directed downward, the neuroaciculum upward, at the recurved tip.

The numerous specimens examined show some interesting, though perhaps not important differences. In some the superior edge of postsetal lobes is developed as a foliaceous process, between segments 10 to 30; in others such a process is lacking, or only slightly developed.

Distribution.—This species occurs in all Antarctic regions, also southern South America to the La Plata River, and in deep water off Maine (Verrill, 1874). It is recorded from littoral zones to 1200 fms.

***Aglaophamus peruana* (Hartman), new combination**

Nephtys macroura peruana Hartman, 1940, p. 236, pl. 39, figs. 89, 90, pl. 40, figs. 96, 97.

Collections.—(see Hartman, 1940, p. 236).

This is referred to *Aglaophamus* because interramal cirri are involute. The original subspecies is raised to specific rank since it differs from *Aglaophamus macroura* (see above) in some major characters.

The prostomium is broadest in front and has a thin, spatulate margin that is prolonged ectolaterally as the slender, tapering frontal antennae. The posterior antennae are much larger, long triangular, and inserted far back at the sides of the prostomium. The posterior margin of the prostomium extends medially backward as a tapering, slightly pigmented raised ridge to the anterior end of the second segment. Nuchal organs are located at the postectal margins where the first segment adjoins. There are no eyespots. The ventral folds of the mouth extend back to the sixth segment.

The proboscis (seen by dissection) is much like that in *A. macroura* (above). It has 22 bifid terminal papillae, with the middorsal and midventral ones the smallest. There are 22 longitudinal rows in the subterminal series, with 2 or 3 irregular rows; these abruptly give rise to 14 longitudinal rows with 4 or 5 in a row and each of these divides into 2 or 3 small papillae. The proximal surface of the proboscis is smooth. There is no middorsal or midventral papilla. The paragnathal jaws are horny yellow and broadly embedded.

The first segment is longer and narrower than those farther back; it is clearly biramous with numerous setae in each branch. The neuropodium extends forward and under the notopodium; it has a large, triangular ventral cirrus that exceeds in size the posterior prostomial antennae and is considerably larger than ventral cirri farther back. Neurosetae are in a larger preacicular fascicle and an inconspicuous postacicular one. The first notopodium is a low mound with a minute notopodial cirrus; it carries a full fascicle of preacicular and a weak bundle of postacicular setae.

Interramal cirri are first present from the third segment and partly inscribe a spiral; within a few segments they are rapidly larger and come to be coiled. The notopodial cirrus is broadly foliaceous and ends distally in a filamentous tip. The subacicular portion of notopodia and the supra-acicular of neuropodia is greatly prolonged as a digitate lobe,

notably more so than in *A. macroura* (Schmarda). Postsetal lobes of notopodia are broad, foliaceous and not bifid (see Hartman, 1940, pls. 39 and 40).

A. peruana differs from *A. macroura* (see above) especially for having a prostomium that is broadly spatulate in front; interramal cirri are already large on the third segment; postsetal notopodial lobes are entire, not incised; acicular lobes are more prolonged than in *A. macroura*.

Distribution.—*A. peruana* is known only from Peru in 10 to 40 fms.

***Aglaophamus dibranchis* (Grube), new combination**

Nephtys dibranchis Grube, 1878a, p. 536; McIntosh, 1885, pp. 161-162; Ehlers, 1905, pp. 14-15; Fauvel, 1932a, pp. 117-118. *Not* Hartman, 1940, p. 237.

Nephtys verrilli McIntosh, 1885, pp. 163-164, pl. 26, figs. 6, 7, pl. 32a, fig. 8.

The species is here characterized to distinguish it from *A. dicirris* (see below) with which it may be confused. The prostomium has a pair of conspicuous eyespots near its posterior margin. The proboscis has 14 longitudinal rows of subterminal papillae and each row tends to be divided at its proximal end to form 2 rows of smaller papillae. There is a long middorsal papilla. Notopodial cirri are cirriform, their length not as great as that of their respective interramal cirri. The superior edge of neuropodia has a long, cirriform erect lobe. Postsetal lamellae are simple and entire in both notopodia and neuropodia. Furcate setae are present in both rami and accompany the postacicular setae.

Some specimens earlier recorded as this species (Hartman, 1940, p. 237) are to be referred to *A. dicirris* (see below). *A. mirasetis* (Hoagland) may belong here (see below).

Distribution.—*A. dibranchis* (Grube) was first described from New Guinea and is now known from other parts of the Indopacific area.

? *Aglaophamus mirasetis* (Hoagland), new combination

Nephtys mirasetis Hoagland, 1920, p. 610, pl. 48, figs. 5-8.

This species is referred to *Aglaophamus* Kinberg because its interramal cirri are involute, not recurved. It was described from a single individual 45 mm long and with 78 segments. The proboscis presumably has 22 terminal papillae and as many subterminal rows with 8 in a row at the sides and only 5 medially; there is none distinctly middorsal; the proximal surface is smooth.

Origin of interramal cirri is not known. Notopodial cirri are long and slender. The notopodial postsetal lamella is broad and foliaceous. Some neuropodia have a long, cirriform erect process at the superior edge but the origin or distribution of this process is not known. Setae consist of preacicular barred, postacicular lanceolate and furcate spines.

A. mirasetis resembles *A. dibranchis* (see above) in most of its known characters, and may be identical. The reported number of proboscoidal rows is different, but this character may be erroneously stated.

Distribution.—*A. mirasetis* (Hoagland) is known only from its type locality, Tinakta Island, Philippines in 16 fms.

***Aglaophamus dicirris*, new species**

Plate 18, figs. 1-8

?*Nephtys verrilli* Cowles, 1931, p. 320. Not McIntosh, 1885, p. 163. *Nephtys dibranchis* Monro, 1933a, pp. 56-57, fig. 24; ? Treadwell, 1937b, p. 149; Hartman, 1938, pp. 144-146; Hartman, 1940, p. 237; ? Berkeley, 1941, p. 33; Hartman, 1945, pp. 7, 22.

Collections.—The numerous individuals fall into 2 groups; in one the interramal cirri are first present from segment 5, rarely 6. These include: 185-34 (2); 187-34 (1); 213-34 (3); 250-34 (1); 421-36 (1); 436-36 (6); 492-36 (1); 513-36 (1); 667-37 (2); 668-37 (1); 770-38 (1); 1030-40 (1); 1052-40 (2); 1074-40 (2); 1078-40 (1); 1088-40 (1); 1096-40 (5); 1097-40 (2); 1117-40 (1); 1197-40 (1); 1275-41 (1); 1283-41 (1); 1295-41 (1); 1365-41 (7); 1374-41 (1); 1703-49 (1); 1732-49 (1); Beaufort, North Carolina (1). In a second group the interramal cirri are first present from segment 7 or 8. These include: 1069-40 (3); 1252-41 (1); 1254-41 (1); 1256-41 (2); 1265-41 (6).

Collection 436-36 is selected as the holotype. Length of largest individuals is 27 to 44 mm but most are smaller. Some of the larger specimens have the body cavity distended with ova, indicating possibly full growth. The body tapers gradually backward and has no inflated anterior region (preserved). There is no color except for the 2 dark eyespots at the posterior margin of the prostomium.

The prostomium is longer than wide and approximately rectangular in shape when the proboscis is retracted (fig. 2). The anterior margin is truncate and has a pair of subequal antennae, or also an accessory one (figs. 1, 2). The 2 eyes are located at the postectal margins just within the nuchal organs. The latter are conspicuous at the inner bases of the first parapodia; when everted they resemble small fleshy horns.

The proboscis (everted in some individuals) is clavate in shape. Its entire surface is closely strewn with minute, low papillae that can be identified as blunt cones under high magnification. Seen from the top they resemble tiny buttons. The distal end of the proboscis ends in 22 bifid papillae (fig. 1). The subterminal rows also number 22, each row with about 9 at the sides and decreasing to 6 or 7 middorsally and mid-ventrally; there are 2 additional reduced ones medially, but there is no one distinctly middorsal.

All parapodia are biramous but the first neuropodium is reduced and has a setal fascicle that is smaller than those farther back. Notopodial and ventral cirri of the first segment are larger than those farther back and subequal to each other. Interramal cirri are first present from segment 5 (or 6) or not until segment 7 or 8 (see under *Collections*, above) and continued back nearly to the end of the body; the last 6 to 10 segments may lack these cirri. They are involute and inscribe a complete spiral where best developed. Except in the first few segments, they greatly exceed in length and size their respective notopodial cirri.

Notopodia consist of an entire postsetal, foliaceous lamella directly behind the postsetal fascicle, not above it, as in *A. erectans* (see below). The notoacicular lobe is conical and the yellow aciculum projects from its distal end as a recurved hook. The notopodial cirrus is slender and tapering. Neuropodia have a characteristic superior, digitate lobe that is erect and long; it projects distally for a length about equal to that of the neuropodium (fig. 3). It is first present at about segment 14 and continued far back, nearly to the end but absent from about the last 10 segments where the body tapers rapidly. Neuropodial postsetal lamellae are broad and foliaceous, but not as long as their corresponding notopodial lamellae.

Setae are of 3 kinds including preacicular barred, postacicular lanceolate and furcate spines. In anterior segments the barred setae are heavier and more conspicuous than their accompanying postacicular setae but after the origin of the furcate spines, at about the sixth segment, the barred setae decrease in relative size and come to be more slender than postacicular setae. Lanceolate setae are of 2 intergrading kinds. Those in upper and lower parts of the fascicles are nearly smooth all around. Those in the middle, where accompanied by furcate setae, are profusely and irregularly covered with fine spinelets on the cutting edge (fig. 5) and nearly smooth on the opposite side. The shaft is cylindrical and smooth; the distal end is slender and pointed. These setae number 6 to 8 in a fascicle and they alternate with as many furcate setae; their relations and comparative sizes suggest that the latter function to clean the spinous parts of the lanceolate setae.

Furcate setae (fig. 4) are first present from about the sixth segment and continue posteriorly through most segments in both notopodia and neuropodia. The 2 tines are about equally long and thick; the strengthening fibers extend along the inner sides of both tines, though directed somewhat away from the center; the 2 tines are nearly symmetrical. The pygidium terminates in a long, median cirriform process.

In a second group of individuals (see under *Collections*, above), the interramal cirri are not present before segment 7 or 8. The postsetal lamella of notopodia tends to be somewhat superior instead of immediately behind the setal fascicle. In other respects, however, including the peculiar details of the proboscis and the diffusely spinous setae, the specimens agree with those described above. It is further noteworthy, that among 6 individuals from one station (1265-41) some smaller, 15 mm long individuals have interramal cirri first present from segment 5, whereas the largest one, 44 mm long, does not have them before segment 8.

A. dicirris grossly resembles *A. dibranchis* (see above) in some respects, and some individuals were earlier (Hartman, 1940, p. 237) so identified. In both the prostomium has a pair of dark eyespots near the posterior margin; neuropodia have a long, erect lobe on the superior edge. In *A. dicirris*, however, the proboscis has 22 rows of papillae whereas in *A. dibranchis* there are 14 rows (which may however be secondarily divided proximally). The proximal surface of the proboscis is diffusely papillated in *A. dicirris* and presumably smooth in *A. dibranchis* (Grube).

Nephtys dibranchis Monro (1933a, p. 56) from Gorgona Island, Panama in 20-30 fms, is here referred to *A. dicirris* since the proboscis has 22 rows of subterminal papillae with none distinctly medial; interramal cirri are first present from segment 5 and continued back on most body segments. Other records of *N. dibranchis* from tropical or subtropical parts of the Eastern Pacific are perhaps also this, thus *Nephtys dibranchis* Berkeley (1941, p. 340) from Santa Cruz Island, California. It is likely also that *Nephtys verrilli* Cowles (1931, p. 340) from Maryland, belongs to this species.

Holotype.—from station 436-36 and paratypes in the Allan Hancock Foundation.

Type locality.—Piñas Bay, Panama, shore (station 436-36).

Distribution.—*A. dicirris* occurs in warm waters of both sides of tropical and subtropical America and the Gulf of California, Mexico; it extends north at least to southern California in the west and Beaufort, North Carolina or possibly Maryland on the Atlantic side; its known range is intertidal to 72 fms.

***Aglaophamus tabogensis* (Monro), new combination**

Nephtys tabogensis Monro, 1933a, pp. 53-55, fig. 23 (in part).

Material examined.—Type collection in the British Museum, London, England.

This species is referred to *Aglaophamus* because it has interramal cirri that are involute, not recurved. Both notopodia and neuropodia have furcate setae. The proboscis has 20 terminal, bifid papillae; the subterminal papillae are in only 2 or 3 in a row and there is a single giant one middorsally. The prostomium is rectangular seen from above and longer than wide; there are no visible eyespots.

Involute interramal cirri are present from segment 8 and disappear between segments 40 and 50. They are best developed between segments 25 and 35 where they are spiralled and greatly exceed in size their respective notopodial cirri. The latter are small and cirriform except between segments 20 to 25 where they are much prolonged though still cirriform; here they exceed in length their accompanying interramal cirri. Acicular lobes are acutely conical. Neuropodia have a small erect lobe on the superior edge; it is present at least on anterior segments through the twenty-fifth but is nowhere long.

A. tabogensis (Monro) was first thought to include individuals with interramal cirri involute and also recurved. I am regarding these as belonging to 2 different species in 2 genera, the other named *Nephtys monroi* (see above).

Distribution.—*A. tabogensis* (Monro) is known only through its original discovery from Taboga Island, between Taboga and Taboguilla, Pacific side of Panama in 6-12 fms, from a muddy bottom.

***Aglaophamus erectans*, new species**

Plate 19, figs. 1-10

Nephtys malmgreni Treadwell, 1914, p. 192, in part. *Not* Théel, 1879.

Collections.—1133-40 (9); 1256-41 (1); 1262-41 (1); 1311-41 (1); 1313-41 (1); 1316-41 (1); 1318-41 (2); 1321-41 (6); 1366-41 (1); 1435-41 (1); near Guadalupe Island, off western Mexico in 40 fms, green mud, collected Sept. 1, 1906 (5); Gulf of Catalina, California in 165-230 meters in green mud and sand, collected June 28, 1901, by C. A. Kofoed (8); off Redondo Beach, California in 50-100 fms, collected June, 1941 by T. Burch (8).

There is no distinct color pattern but the prostomium (fig. 1) is partly diffused with brown, and the ventral side of the body has a broad brown line in the middle. Length of 34 or 35 segments is 21 to 27 mm;

width with parapodia is to 5.2 mm at the widest part or segment 16.

The prostomium is approximately rectangular and has a straight anterior margin; its posterior half is pigmented. There are no visible eyespots. Nuchal organs are inconspicuous between the upper edge of the first notopodia and the postectal margin of the prostomium. Frontal antennae taper distally; they resemble the first pair of ventral cirri except that they are not constricted near the base. Posterior antennae originate just behind and ventral to the anterior pair; they are broader and slightly longer than the first pair. When the proboscis is retracted the lateral margins of the mouth extend through the first and most of the second segment. The lower lip with its outer margins extends from the middle of the second, to the middle of the fifth segment.

The proboscis has 14 rows of bifid terminal papillae and the same number in the subterminal rows. These number 10 to 13 in each row and they decrease in size going proximally; there is no distinct middorsal or midventral papilla. The proximal surface of the proboscis is smooth (fig. 1).

Parapodia are biramous throughout. The first are large, directed forward and project beyond the prostomium. The first neuropodium exceeds its notopodium in size; the ventral cirrus resembles the frontal antennae. The first neuroacicular lobe is acutely prolonged and nearly as long as the ventral cirrus. Neurosetae number about 15 to 20 in a fascicle. The first notopodium has a small notopodial cirrus and its setae include both barred preacicular and lanceolate postacicular ones.

Farther back the parapodial rami are widely separated from each other (fig. 2). Interramal cirri are involute and may be first present from segment 9 where they are tiny, or not until segment 11. They increase in size gradually and come to be spiralled (fig. 3) by segment 17. Typical notopodia have a small postsetal foliaceous lamella that is superior in position. Notopodial cirri are short, conical and smaller than their respective interramal cirri except in anterior segments where the latter are lacking.

Acicular lobes in both notopodia and neuropodia are conical. Acicula occur singly; they project from the distal end of the lobe and are recurved at the tip (fig. 4). An erect lobe at the upper edge of neuropodial lobes is present as a small papilla from about segment 16; it appears as a separation between the presetal and postsetal lobes. This papilla enlarges gradually so that by segment 27 it is as shown in fig. 3; it is never as large or long as the comparable process in *A. dicirris* (see above). Farther back it comes to be only slightly longer; in posterior segments it decreases and is probably absent from a considerable posterior portion.

Setae consist of preacicular barred (figs. 7-10) and postacicular lanceolate ones. Furcate setae have not been identified. The lanceolate setae have transverse rows of serrations (figs. 5, 6).

Most of the individuals listed above are anterior fragments or at least not posteriorly complete. Since they are from dredged collections, and sometimes in groups, it is suggested that they may form beds. Most specimens come from green mud.

A. erectans resembles *A. malmgreni* (Théel) in some respects. Both have a proboscis with 14 rows of papillae and with 10 to 13 in a row and both lack a large middorsal papilla. In both the acicular lobes are conical and the postsetal lobes are inconspicuous; the interrhamal cirrus is small or absent in a long anterior region. *A. erectans* differs from *A. malmgreni* in that eyes are absent, not present; neuropodia have an erect superior lobe from about segment 16 which is continued through median segments; this lobe is absent from *A. malmgreni* (Théel).

Holotype from station 1316-41, and paratypes in the Allan Hancock Foundation.

Type locality.—One mile southwest of Ben Weston Point, Santa Catalina Island, California in 45 fms (station 1316-41).

Distribution.—Southern California and Lower California, Mexico, in depths of 20 to 172 fms, in mud.

***Aglaophamus rubella* (Michaelsen), new combination**

Nephtys rubella Michaelsen, 1897, pp. 19-24, pl. 1, figs. 5-8; Fauvel, 1923, p. 373, fig. 145.

Interrhamal cirri are involute, thus this is referred to *Aglaophamus*.

***Aglaophamus rubella anops*, new subspecies**

Nephtys malmgreni Berkeley, 1924, p. 290 (Fide Berkeley, 1945, p. 327).

Nephtys rubella Berkeley, 1945, p. 327.

Collections.—Mittelnacht Island, Canada (1, gift from Drs. E. and C. Berkeley); off Alaska in 185-300 fms, dredged by U.S.S. *Albatross* (1).

A complete specimen with 55 segments measures 17 mm long. The body is diffused reddish brown but there is no pigment pattern (preserved). The prostomium is pentagonal, with slightly arcuate frontal margin and straight sides; the posterior margin is medially prolonged so as to extend back to the end of the first segment. The frontal antennae are at the anteroectal margins of the prostomium and nearly as large as the posterior antennae; the latter are inserted at the sides of the prostomium; there are no eyespots such as are present in the stem species.

The proboscis (seen by dissection) has 14 longitudinal rows of sub-terminal papillae with 15 to 20 in a row; the largest are distal and they diminish in size proximally to very minute ones. There is none in middorsal or midventral positions. The proximal surface is smooth.

Interramal cirri are involute and first present from the fourth segment; they are small at first but come to inscribe a complete spiral within a few segments; they are present on all segments to near the end of the body. The first segment is similar to that shown for the stem species (Michaelsen, 1897, pl. 1); ventral cirri are large triangular and project forward; the first notopodium is present as a low mound with a very small notopodial lobe. Preacicular setae in both rami surpass and outnumber postacicular ones. Farther back the ventral cirrus is much smaller and other parapodial parts are more developed.

In typical parapodia the notopodium consists of a broad upper postsetal lobe and a much smaller, inconspicuous lower portion that is surpassed by the conical acicular lobe. Its presetal part is short and notched, with the superior part the larger. Neuropodia have a broad, foliaceous postsetal lobe that extends out slightly beyond the conical acicular lobe; the preacicular part is weakly notched. A slight prolongation or spur of the superior edge of the neuropodium corresponds to the erect superior lobe of the stem species. Ventral cirri are large and triangular. Preacicular setae are barred; postacicular setae are long, tapering, finely denticulate at the cutting edge. Furcate setae are absent. Acicula are yellow, deeply embedded except for the recurved tip.

A. rubella anops differs from the stem species, *A. rubella* (Michaelsen) most conspicuously in its much smaller size, 55 mm as against 60-120 mm long; the prostomium lacks eyespots instead of having them; interramal cirri are present from the fourth, instead of third segment; the proboscis has only 15-20 papillae in subterminal rows instead of 30-40 papillae.

The specimen selected as holotype was reported as *Nephthys rubella* Michaelsen by Berkeley (1945, p. 327) collected from Mittelnacht Island, east end of Vancouver Island; it is a gift from Drs. E. and C. Berkeley to whom thanks are here extended. The paratype was dredged, with *Goniada annulata* Moore, by the U.S.S. *Albatross* on August 29, 1905, station 4748.

Holotype and paratype in the Allan Hancock Foundation.

Type locality.—Mittelnacht Island, east end of Vancouver Island, Canada.

Distribution.—Vancouver Island and between Departure Bay and Clarke Rock, western Canada in 20 fms (Berkeley, 1924); also Yes

Bay to Anan River and return, *Albatross* station 4748, August 29, 1905, in 185-300 fms.

***Aglaophamus inermis* Ehlers**

Nephtys inermis Hartman, 1940, p. 234, pl. 39, figs. 84-86, pl. 40, fig. 95.

Collections not previously reported.— 931-39 (2); 1097-40 (1).

This species is clearly characterized for lacking terminal and sub-terminal papillae on the proboscis; both notopodial and ventral cirri are long and cirriform.

Distribution.—This occurs on both sides of tropical America and has been recorded also from the Mediterranean Sea and the Gulf of Suez (Monro, 1937, p. 283). It is intertidal to depths of 53 fms.

***Aglaophamus lobophora* (Hartman), new combination**

Nephtys lobophora Hartman, 1940, pp. 234-236, pl. 40, figs. 91-94.

Collections.—(See Hartman, 1940, p. 234).

This is here referred to *Aglaophamus* since interramal cirri are involute.

Distribution.—It is known only from Peru in 10-30 fms.

***Aglaophamus lutreus* (Baird), new combination**

Nephtys lutrea Baird, 1873, p. 95.

? *Nephtys virgini* Ehlers, 1897, pp. 19-23, pl. 1, figs. 9-12. *Not* Kinberg, 1866.

Material examined.—Type specimen of *Nephtys lutrea* Baird from Otter Island, Patagonia, in the British Museum, London, England and specimens labeled *Nephtys virgini* by Ehlers, from Patagonia, in the Swedish State Museum, Stockholm, Sweden.

The type specimen is a single macerated individual. Its published and only account is incomplete but the specimen is now distorted so that parapodial lobes cannot be clearly distinguished. Interramal cirri are seen to be involute, thus this goes to *Aglaophamus*; they are long and inscribe at least a spiral. They are first present though small on the fourth or fifth segment but by the seventh they are much larger. Notopodia have a conspicuous flat, foliaceous cirrus that is located just above the interramal cirrus (notopodial cirrus). Neuropodia have a slender, erect lobe on the superior edge; this is as shown by Ehlers (1897, pl. 1, fig. 12) for *Nephtys virgini*, which I regard as possibly the same.

Setae include preacicular barred, and postacicular serrated ones; the serrations are limited in extent and successive rows are widely spaced. This species was originally compared with *Nephtys impressa* Baird (see

above) and separated from it for its different size. Since the latter is a *Nephtys* with recurved interrampal cirri, the 2 are at once separable. The so-called jointed setae described by Baird (1873, p. 95) may have referred to the preacicular barred setae, but these were further misinterpreted to be postacicular, instead of preacicular in position.

Other specimens examined, labeled *Nephtys virgini* Ehlers (1897, pp. 19-23, pl. 1, figs. 9-12) also from Patagonia and now deposited in the Swedish State Museum, resemble the specimen of Baird. Some neuropodia have an erect lobe on the superior edge; interrampal cirri are involute and first present from segment 4 or 5; the first are small but by segment 5 these cirri are longer than their respective notopodial cirri. The latter are foliaceous but have an acuminate tip. Anterior neuropodia have a short, superior digitate lobe that attains its maximum development at about segment 10-15. The proboscis has 14 rows of subterminal papillae; at the proximal end of the series each row bifurcates to give rise to 2 or more rows of smaller papillae.

A. lutreus bears resemblance to *A. sinensis* (Fauvel) (1932b, p. 536) which also has 14 rows of subterminal papillae on the proboscis and a superior lobe on neuropodia. However, in the latter interrampal cirri are present from the second segment and already well developed by the third one.

Distribution.—*A. lutreus* (Baird) is known only from Patagonia, southern South America.

Genus *Micronephthys* Friedrich, 1939

Type *M. minuta* (Théel)

This genus was erected (Friedrich, 1939, p. 123) for a single species, *Nephtys minuta* Théel (1879, pp. 28-31, pl. 2, fig. 18) from the Russian Arctic Sea. It is characterized for its small size (16 to 19 mm long or less) and few body segments (as low as 30 but perhaps to 75 or more) and perhaps for nearly or altogether lacking interrampal cirri. Parapodial lobes are poorly developed. Setae consist of barred preacicular, and smooth lanceolate postacicular ones. Furcate setae are known only for one species, here referred to this genus, *M. sphaerocirrata* (Wesenberg-Lund). The first segment, like all subsequent ones, is biramous.

In addition to the type species of the genus, *M. minuta* (Théel), the genus may include also the following species: *Nephtys abranchiata* Ehlers (1913, p. 452) from Antarctic seas in 385 meters, and *Nephtys ambrizettana* Augener (1918, pp. 166-168, pl. 2, fig. 13, pl. 3, figs. 60,

61) from Angola, Ambrizette, west Africa. *Nephtys sphaerocirrata* Wesenberg-Lund (1949, pp. 294-296, figs. 24-26) from the Sea of Iran in 13 meters is unique for having notopodial and ventral cirri that are subglobular and furcate setae present. The genus, *Micronephthys* Friedrich, may thus comprise the following: *M. minuta* (Théel), *M. abranchiata* (Ehlers), new combination, *M. ambrizettana* (Augener), new combination and *M. sphaerocirrata* (Wesenberg-Lund), new combination.

Another species described as *Nephtys stammeri* Augener (1932, pp. 663-664, 678-679, fig. 2) from the Adriatic Sea, is said to lack interramal cirri, thus would also go to *Micronephthys* Friedrich. However, parapodia are said to be uniramous and are thus not nephtyid in character. The proboscis was described as eversible and with 14 bifid terminal papillae with the same number of rows subdistally and with to 5 in a row. It appears that the description was based on more than one species, and may partly belong to that of a syllid.

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PLATE 1

Figures 1 to 6, *Goniada brunnea*: Fig. 1, anterior end in dorsal view, x 50; Fig. 2, parapodium 85 in posterior view, x 62; Fig. 3, parapodium 35 in posterior view, x 110; Fig. 4, proboscidal organs from the side of the proboscis, in lateral view showing approximate arrangement, x 2280; Fig. 5, a proboscidal organ in three-quarter view, x 4560; Fig. 6, proboscidal organ in frontal view, x 4560.

Figures 7, 8, *Goniada maculata*: Fig. 7, proboscidal organ in lateral view, x 1950; Fig. 8, proboscidal organ in typical view as seen from above, x 1950.

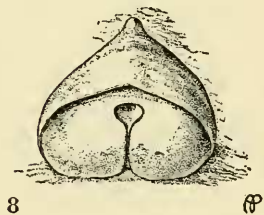
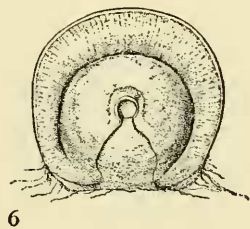
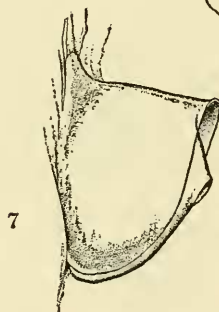
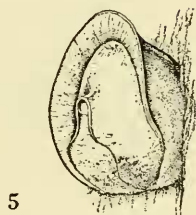
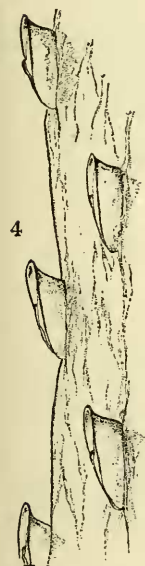
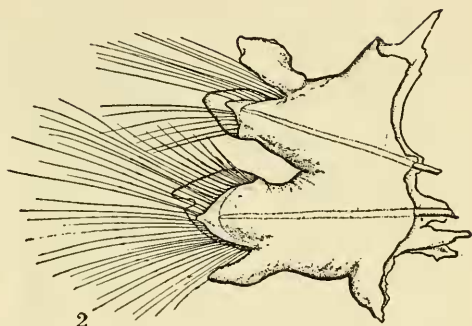
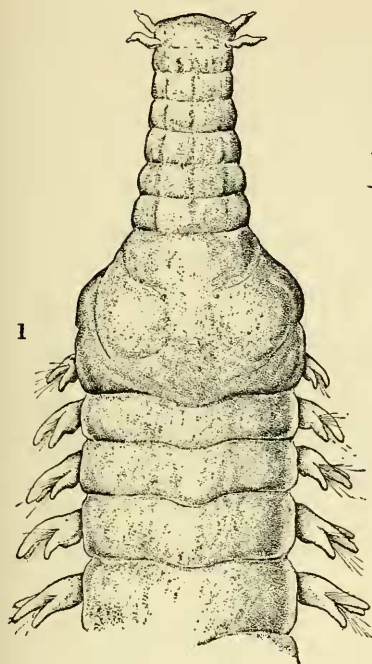
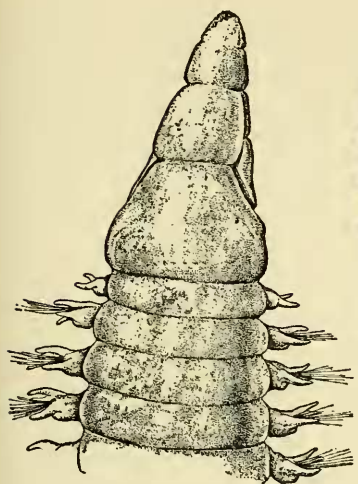


PLATE 2

Figures 1 to 9, *Goniada annulata*: Fig. 1, anterior end in dorsal view, prostomium slightly turned (antennae missing), x 55; Fig. 2, proboscidal chevron from the left side, x 192; Fig. 3, a posterior parapodium in anterior view, x 83; Fig. 4, parapodium 34 in anterior view, x 55; Fig. 5, articulation of a neuroseta in lateral view, x 3500; Fig. 6, end of neurosetal shaft seen from the back, x 3500; Fig. 7, articulation of a neuroseta in three-quarter view, x 3500; Fig. 8, proboscidal organ seen from the oral (front) side, x 1000; Fig. 9, proboscidal organ seen from the side, x 1000.



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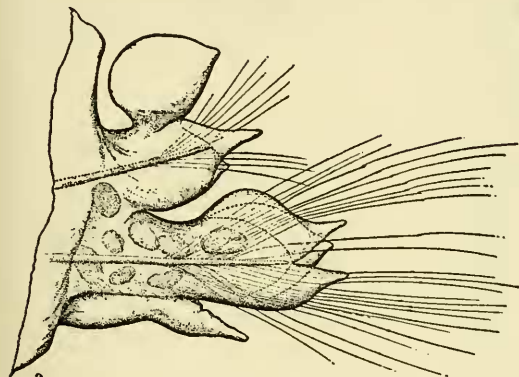
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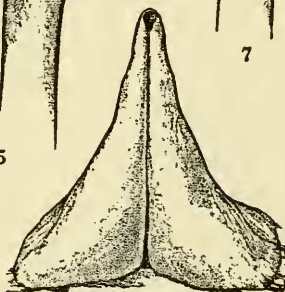
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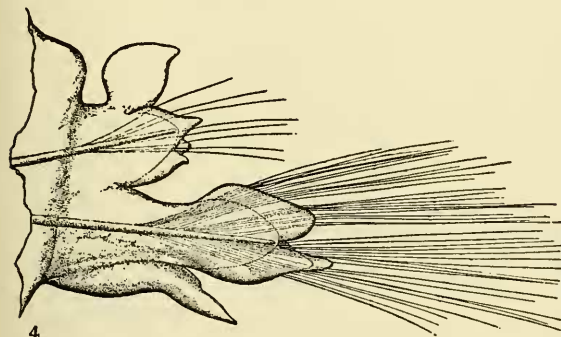
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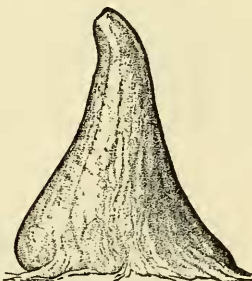
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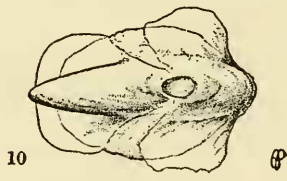
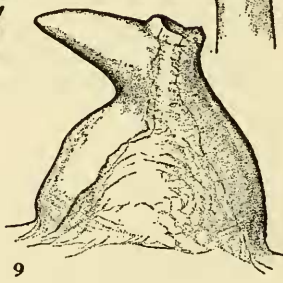
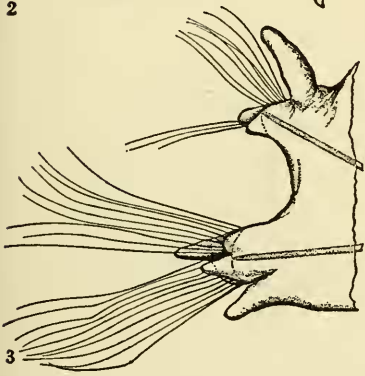
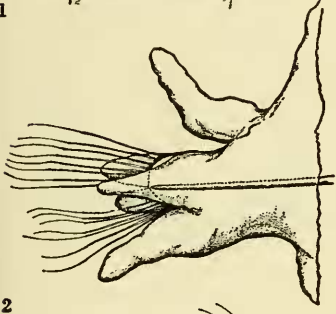
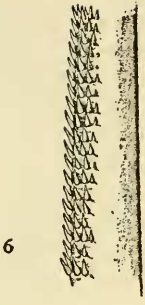
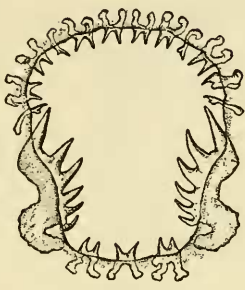
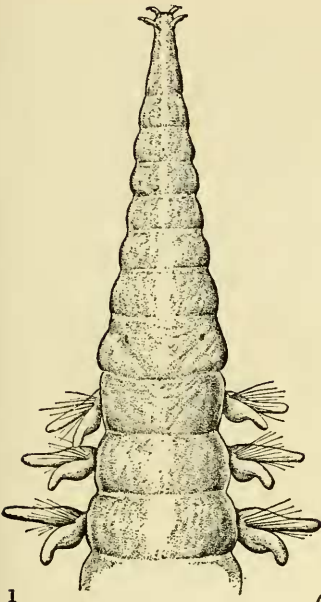


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PLATE 3

Figures 1 to 10, *Goniada littorea* (1451-42): Fig. 1, anterior end in dorsal view, x 130; Fig. 2, parapodium 26 in posterior view, x 250; Fig. 3, parapodium 84 in anterior view, x 180; Fig. 4, circlet of jaws seen from the front, x 270; Fig. 5, chevron from the everted proboscis, x 280; Fig. 6, portion of a seta showing maximum development of spinelets, in three-quarter view, x 4800; Fig. 7, cross section of seta shown in Fig. 6, at base of spinelets, x 4800; Fig. 8, articulation of a composite seta in three-quarter view, x 4200; Fig. 9, proboscidian organ in lateral view (the long spine is directed orally), x 3400; Fig. 10, proboscidian organ seen from above, x 3400.



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PLATE 4

Figure 1, *Goniada brunnea*, chevron with 7 pieces, x 344.

Figures 2, 3, *Goniada acicula* (Atlantic): Fig. 2, proboscidal organ in frontal view, x 2240; Fig. 3, proboscidal organ in three-quarter view, x 2240.

Figures 4 to 7, *Goniada acicula*, (Pacific): proboscidal organs in various positions; Fig. 4, in frontal view, x 2240; Fig. 5, in side view with base extended, x 2240; Fig. 6, in three-quarter view, x 2240; fig. 7, typical views of 4 organs, about x 1000.

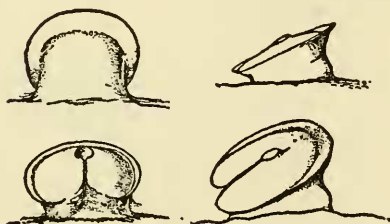
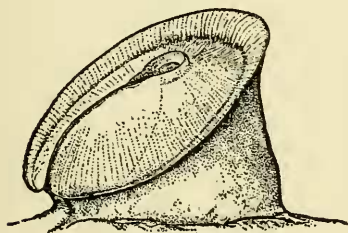
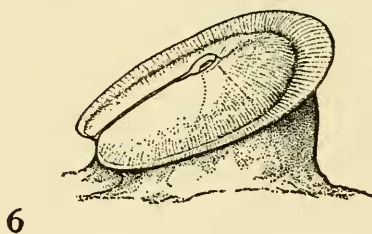
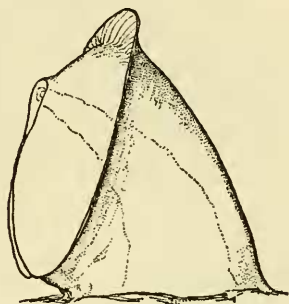
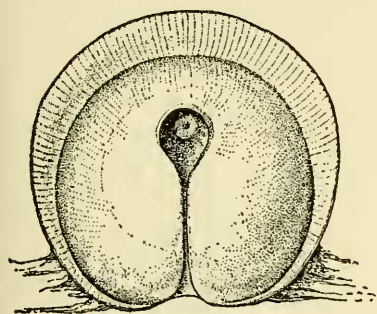
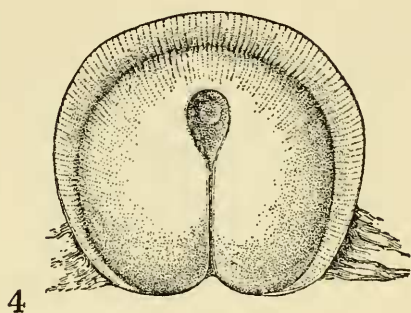
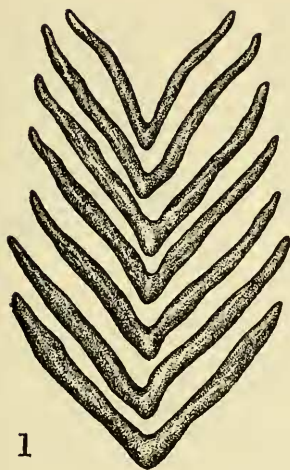
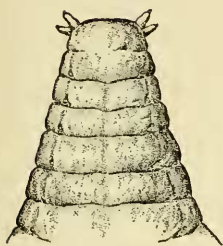


PLATE 5

Figures 1 to 3, *Ophioglycera gigantea*: Fig. 1, prostomium in dorsal view with base torn away, x 40; Fig. 2, parapodium 37 in anterior view, x 40; Fig. 3, parapodium 63 in anterior view, x 40.

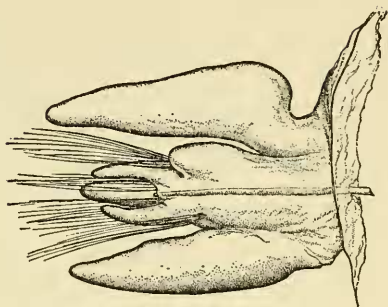
Figures 4 to 8, *Goniadella gracilis*: Fig. 4, end of the setal shaft showing the articulating concavity from the back, x 3240; Fig. 5, inferior composite hook from about parapodium 50, in three-quarter view, x 3240; Fig. 6, chevron from the right side of proboscis, x 740; Fig. 7, about parapodium 50 in posterior view, x 312; Fig. 8, prostomium in dorsal view, x 200.



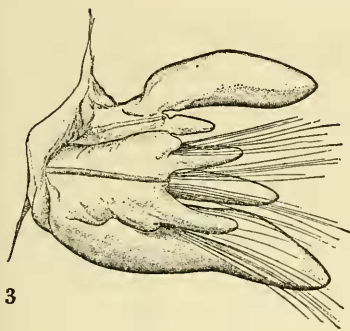
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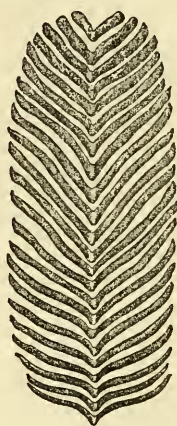
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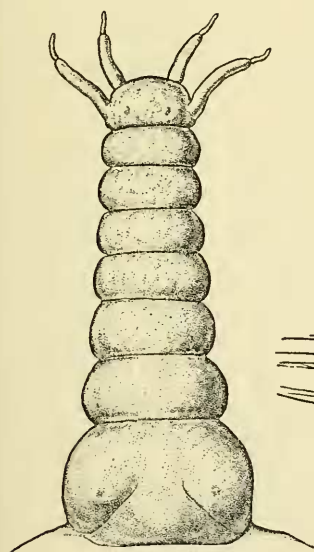
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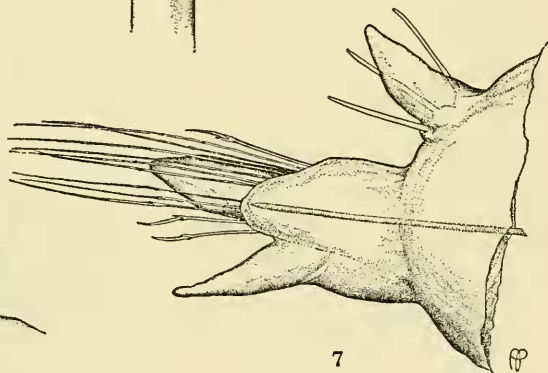
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PLATE 6

Figures 1 to 12, *Glycinde armigera*: Fig. 1, anterior end in right lateral view, with the proboscis about half way everted, x 25; Figs. 2 to 12, proboscidial organs from areas as indicated: Fig. 2, area IV seen from above to show the bosses, x 2300; Fig. 3, area IV in side view, x 2300; Fig. 4, area V in side view, with subapical pore, x 740; Fig. 5, area I seen from top, showing pore and spine, x 4422; Fig. 6, area III in side view, showing pore and spine, x 4500; Fig. 7, area II-1, in side view, x 400; Fig. 8, area II-2, in side view, x 400; Fig. 9, area II-3, in side view, x 400; Fig. 10, area II-4, in side view, x 400; Fig. 11, area II-5, in side view, x 400; Fig. 12, area II-6, in side view, x 400.

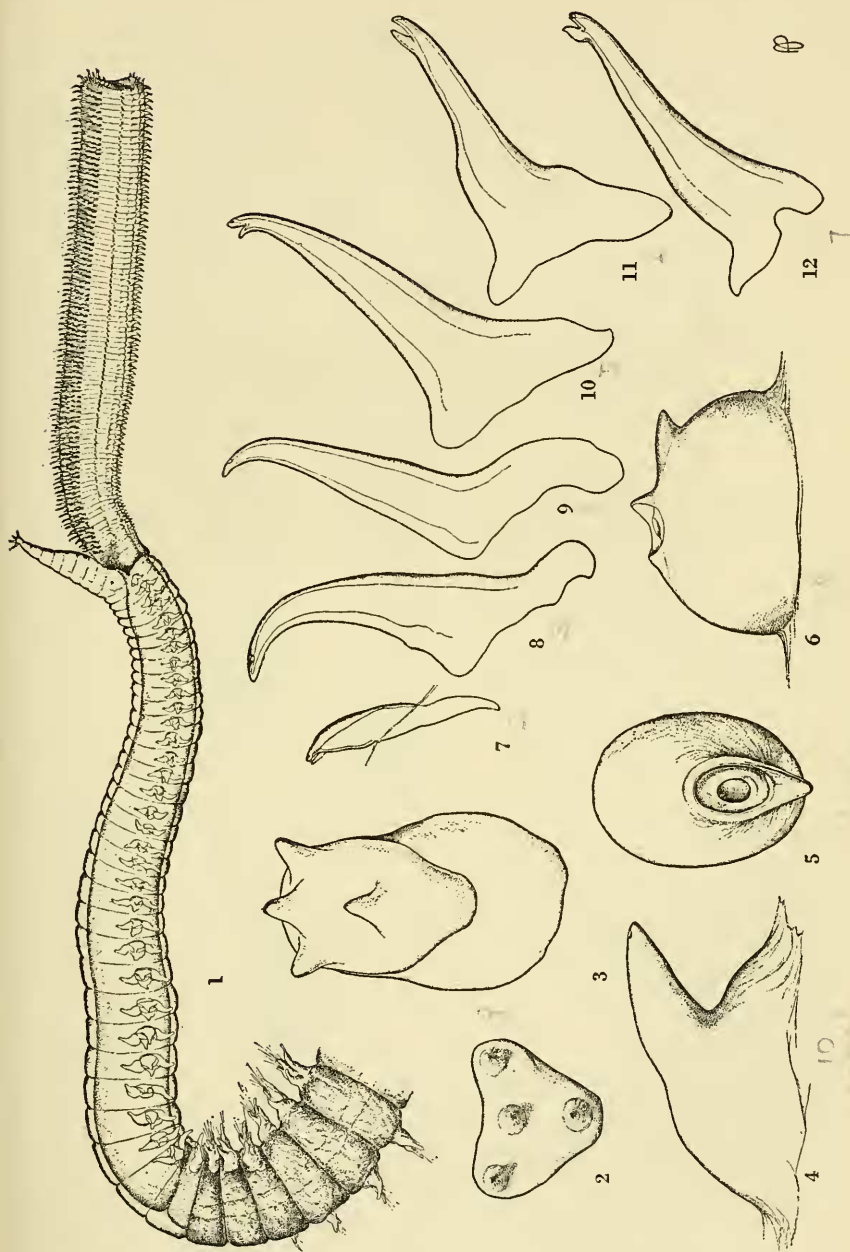


PLATE 7

Figures 1 to 15, *Glycinde solitaria*: Figs. 1-9, proboscoidal organs from areas as indicated: Fig. 1, area II-1, x 870; Fig. 2, area II-2, x 870; Fig. 3, area II-3, x 870; Fig. 4, area II-4, x 870; Fig. 5, area II-5, x 870; Fig. 6, area II-6, x 870; Fig. 7, area V x 1700; Fig. 8, area IV, in three-quarter view, x 1700; Fig. 9, area IV, in side view, x 1700. Fig. 10, middle part of setal appendage in frontal view, x 3000; Fig. 11, cross section of setal appendage through base of spines, x 3000; Fig. 12, end of setal shaft seen from the back, x 3000; Fig. 13, articulation of a neuroseta from parapodium 53, in lateral view, x 3000; Fig. 14, parapodium 15 in anterior view, x 204; Fig. 15, parapodium 57 (ovigerous) in anterior view, x 204.

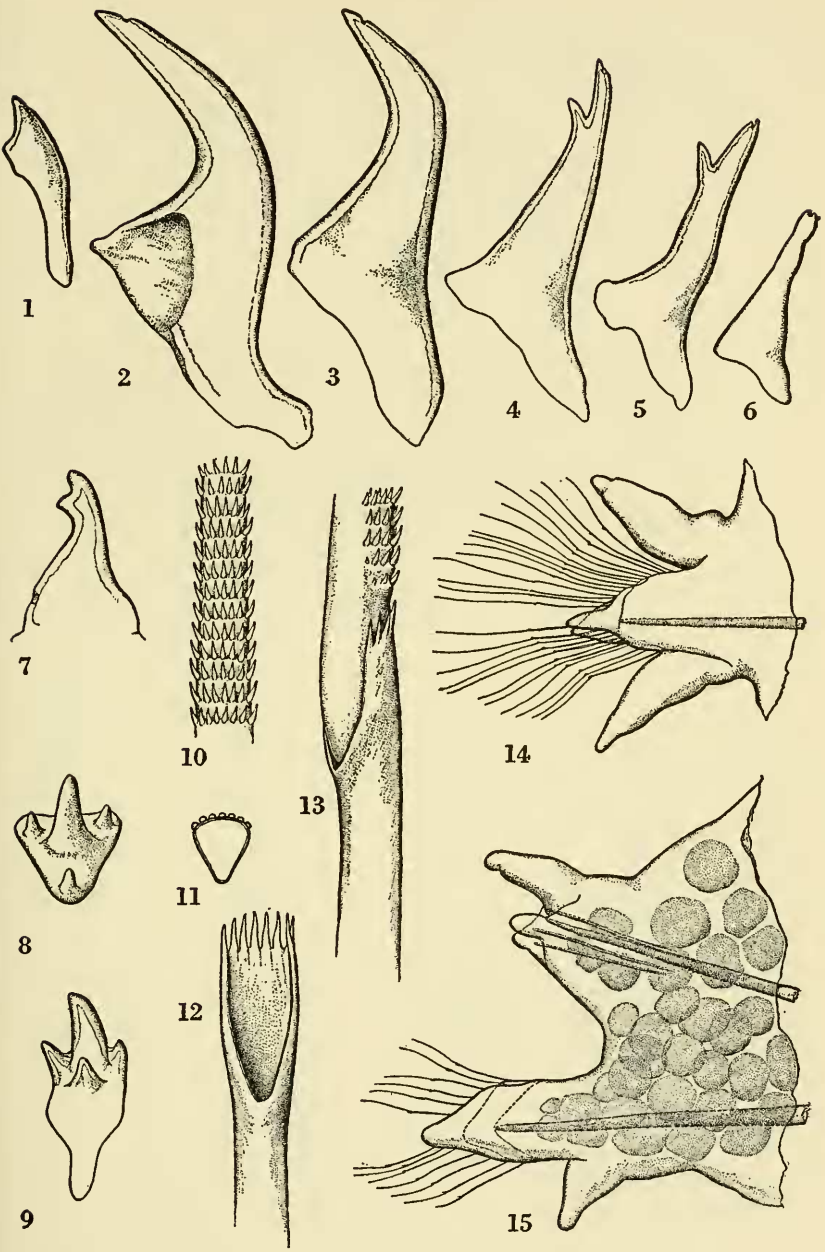


PLATE 8

Figures 1 to 9, *Glycinde polygnatha*: Fig. 1, sixth parapodium, in anterior view, x 126; Fig. 2, median parapodium, in anterior view, x 63; Fig. 3, a far posterior parapodium, in anterior view, x 80; Fig. 4, notoseta from a median parapodium, in lateral view, x 1900; Fig. 5, notoseta from a median parapodium in frontal view, x 1900; Fig. 6, distal end of articulation of a composite seta, x 3000; Fig. 7, distal end of articulation with base of appendage in three-quarter view, x 1060; Fig. 8, composite seta in three-quarter view, x 1060; Fig. 9, cross section of appendage with maximum development of spines, x 4700.

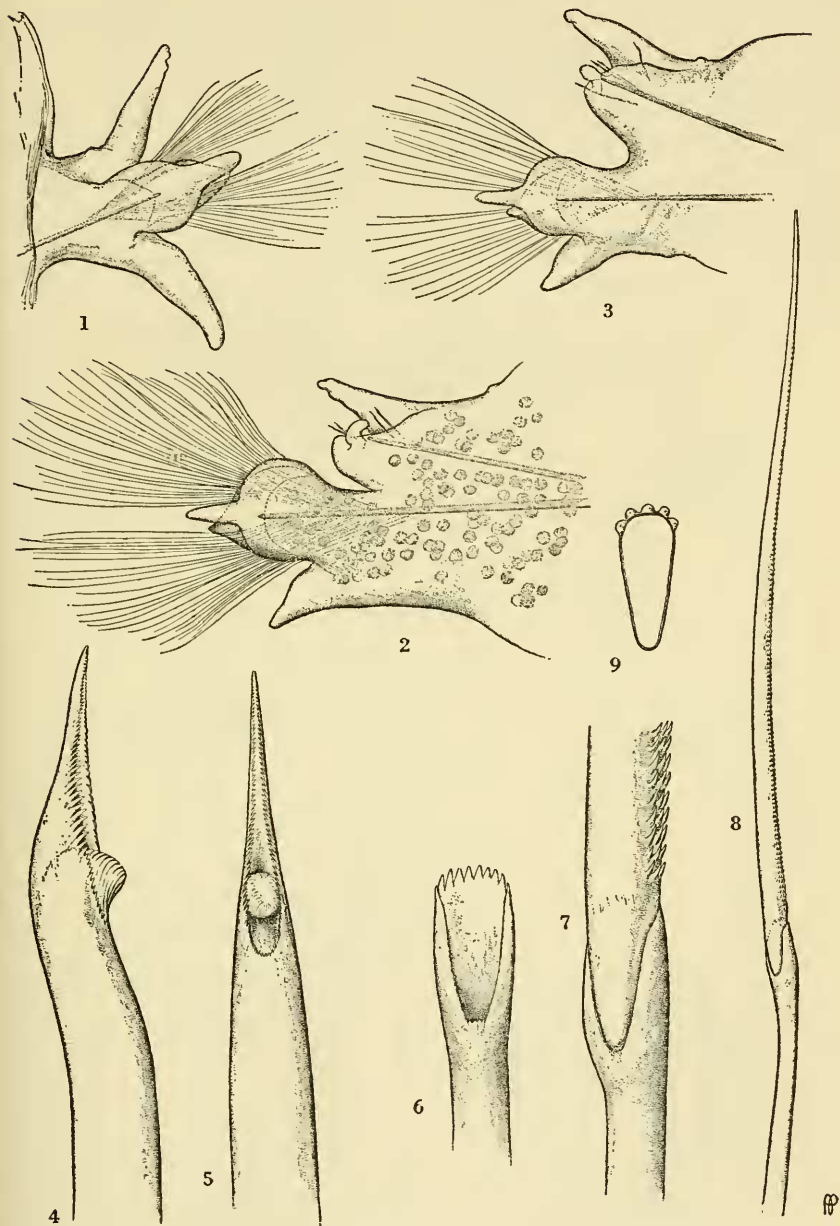
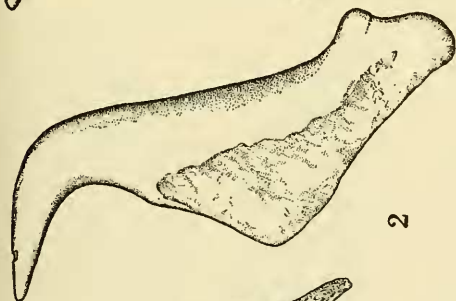


PLATE 9

Figures 1 to 9, *Glycinde polygnatha*: proboscidial organs from areas as indicated: Fig. 1, area II-1, x 450; Fig. 2, area II-2, x 450; Fig. 3, area II-3, x 450; Fig. 4, area II-4, x 450; Fig. 5, area II-5, x 450; Fig. 6, area II-6, x 450; Fig. 7, area I, x 3530; Fig. 8, area III, x 2370; Fig. 9, area IV, x 1180.



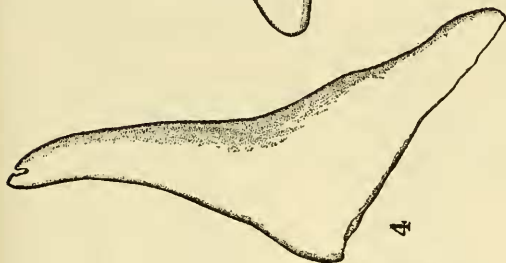
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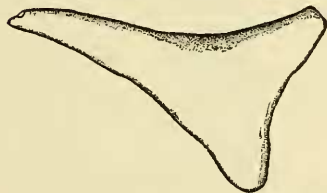
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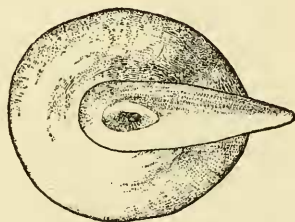
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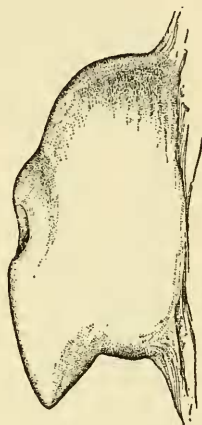
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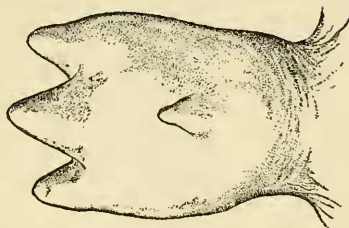
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PLATE 10

Figures 1 to 11, Proboscidial organs from species of *Glycera*: Figs. 1, 2, *G. tenuis*: Fig. 1, in frontal view, x 1250; Fig. 2, in lateral view, x 1250; Figs. 3, 4, *G. oxycephala*: Fig. 3, in lateral view, x 1250; Fig. 4, in frontal view, x 1250; Figs. 5, 6, *G. convoluta*: Fig. 5, in frontal view, x 1600; Fig. 6, in three-quarter view, x 1600; Figs. 7, 8, *G. robusta*: Fig. 7, in frontal view, x 900; Fig. 8, in lateral view, x 900; Figs. 9, 10, *G. dibranchiata*: Fig. 9, in lateral view, x 3000; Fig. 10, in frontal view, x 3000; Fig. 11, *G. tessellata*: in lateral view, x 790.



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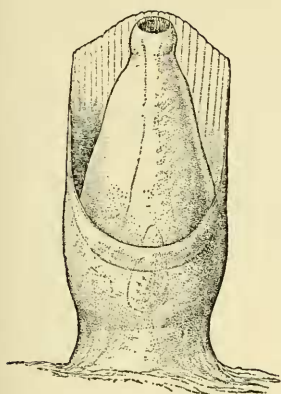
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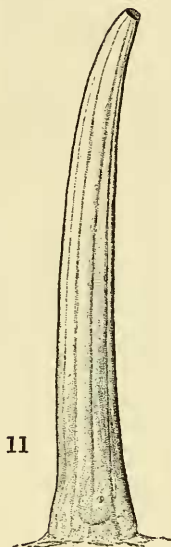
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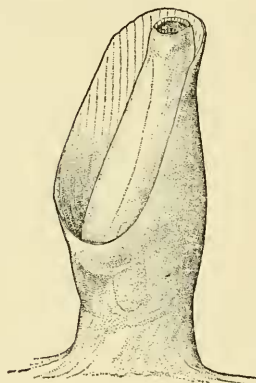
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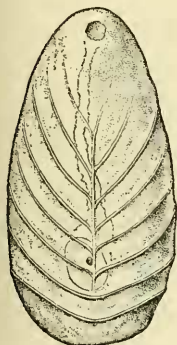
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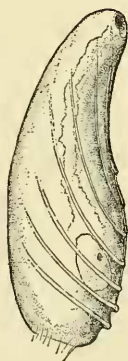
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PLATE 11

Figures 1 to 4, *Glycera capitata*: Fig. 1, middle parapodium in anterior view from California specimen, x 125; Fig. 2, middle parapodium in anterior view from epitokous individual from California, x 63; Fig. 3, middle parapodium in anterior view from Alaska specimen, x 63; Fig. 4, aileron in lateral view from Alaska specimen, x 125.

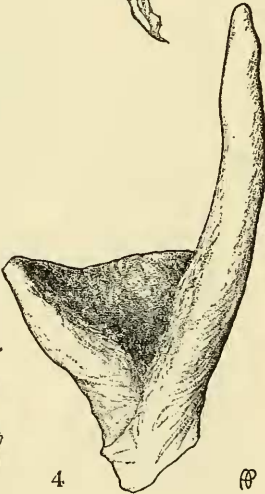
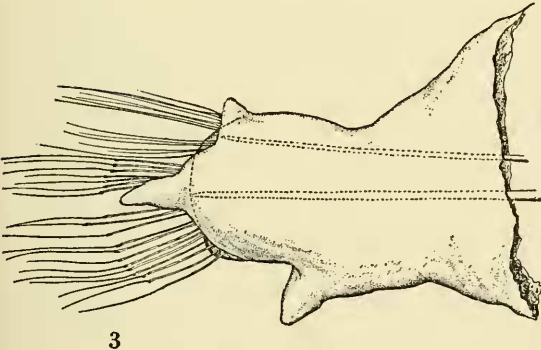
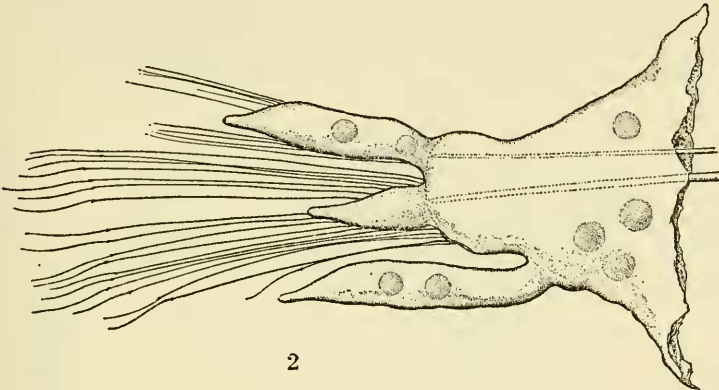
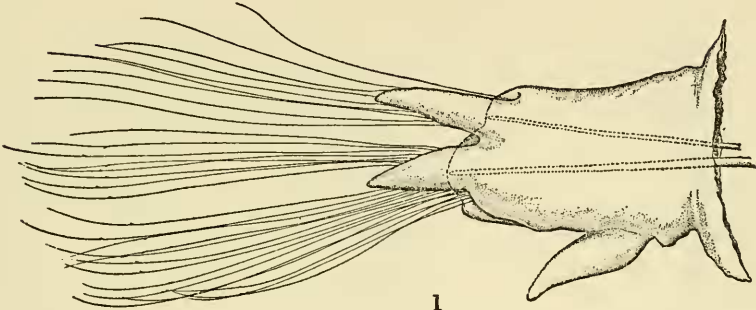
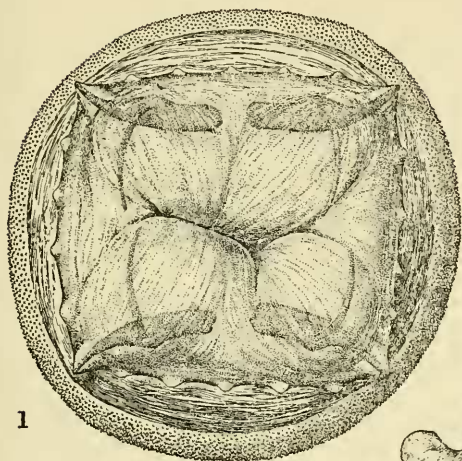
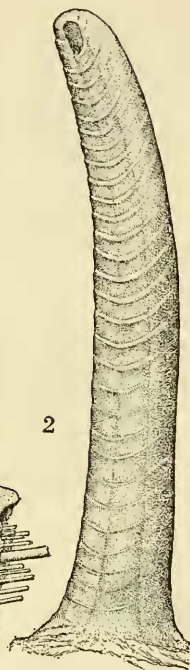


PLATE 12

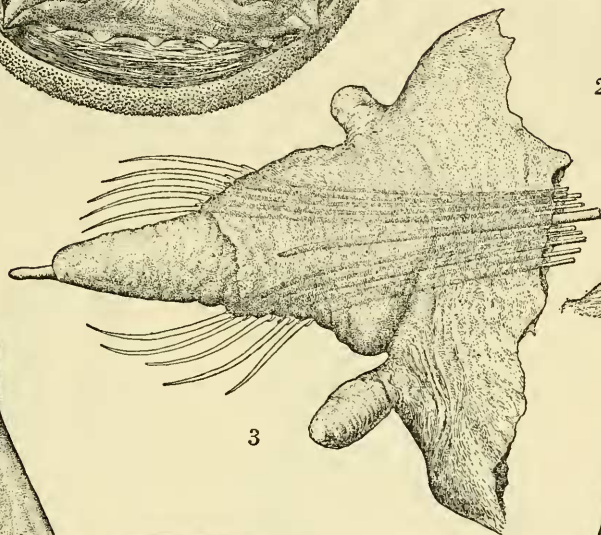
Figures 1 to 5, *Hemipodus armatus* (265-34): Fig. 1, paragnathal end of proboscis seen from the front of the everted proboscis, x 27; Fig. 2, a proboscival organ in three-fourths view, x 881; Fig. 3, a median parapodium in anterior view, x 124; Fig. 4, jaw with attached aileron showing where the latter is attached, x 935; Fig. 5, jaw with aileron, showing curvature of the jaw, x 935.



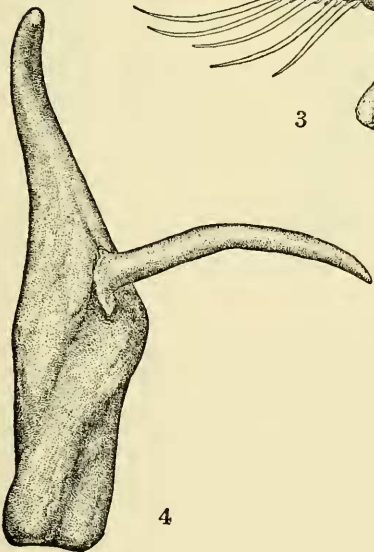
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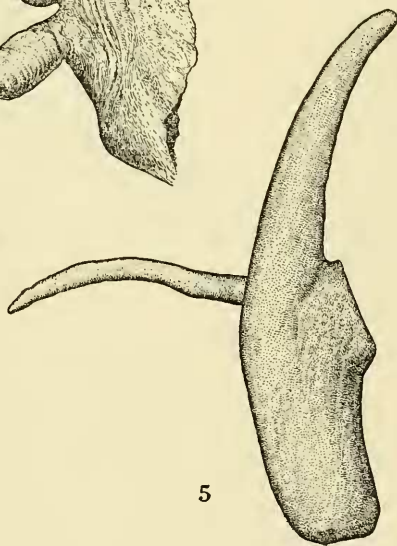
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PLATE 13

Figures 1 to 9, *Nephtys glabra* (1268-41 and 1229-41): Fig. 1, anterior end in dorsal view, proboscis everted, x 20; Fig. 2, seventh parapodium in anterior view, x 16; Fig. 3, sixty-third parapodium in anterior view, x 16; Fig. 4, middle portion of post-acicular notoseta from sixty-third parapodium, x 2200; Fig. 5, basal part of postacicular notoseta from sixty-third parapodium, x 2200; Fig. 6, preacicular barred notoseta from sixty-third parapodium, x 2200; Fig. 7, cross section of seta shown in fig. 6, x 2200; Fig. 8, frontal view of seta shown in fig. 6, x 2200; Fig. 9, frontal view of seta shown in fig. 6, from near middle, x 2200.

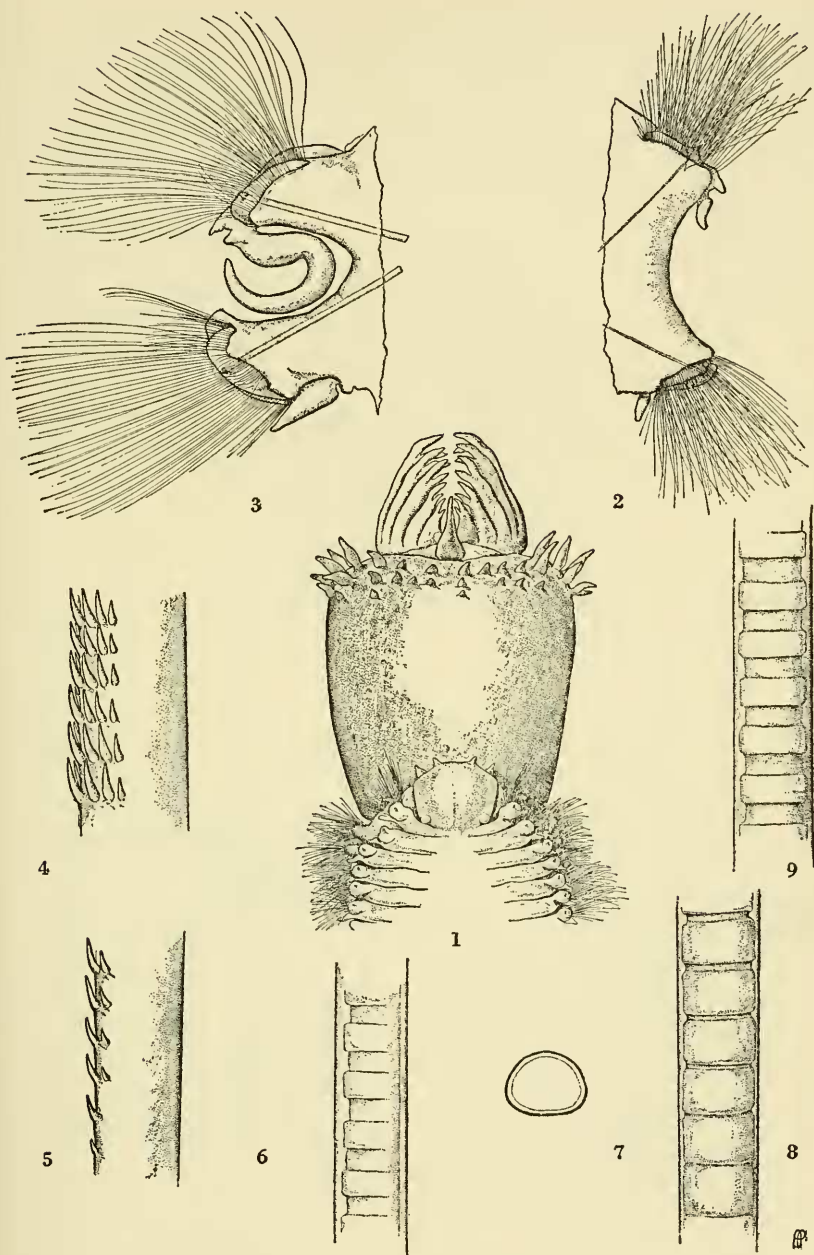
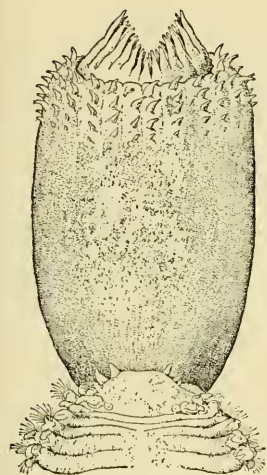
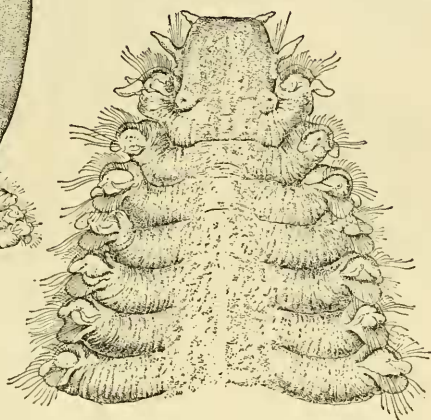


PLATE 14

Figures 1 to 6, *Nephtys assignis* (1379-41): Fig. 1, everted proboscis and first few segments in dorsal view, x 14; Fig. 2, anterior end in dorsal view, proboscis retracted, x 16; Fig. 3, seventh parapodium in anterior view, x 30; Fig. 4, forty-eighth parapodium in anterior view, x 30; Fig. 5, part of a preacicular barred seta seen from the front (barred side), x 4500; Fig. 6, part of a postacicular seta seen in $\frac{3}{4}$ view, x 2364.



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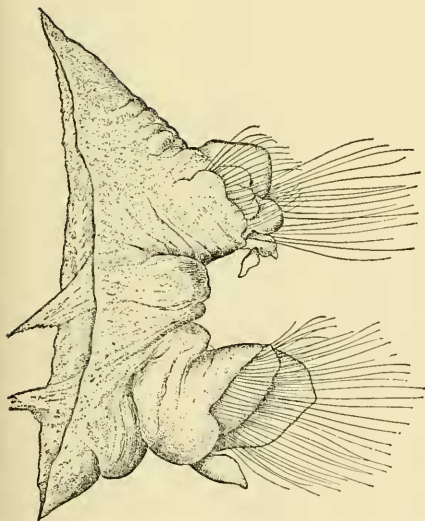
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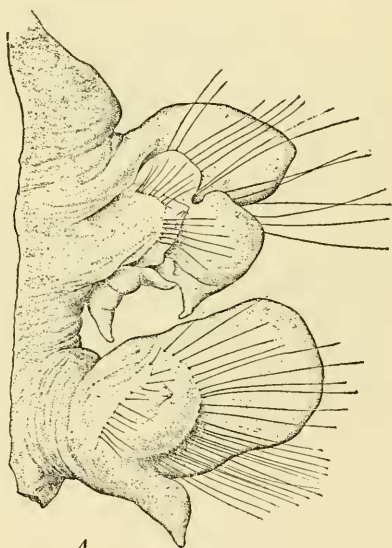
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PLATE 15

Figures 1 to 6, *Nephtys singularis* (770-38): Fig. 1, anterior end including first 5 segments, in dorsal view, x 28; Fig. 2, seventh parapodium in anterior view, x 31; Fig. 3, thirtieth parapodium in anterior view, x 31; Fig. 4, part of a postacicular neuroseta showing portion where stem and blade merge, in lateral view, x 560; Fig. 5, part of a preacicular neuroseta, showing arrangement of transverse bars at about middle of seta, in frontal view, x 382; Fig. 6, part of a preacicular neuroseta, seen from the side, x 382.

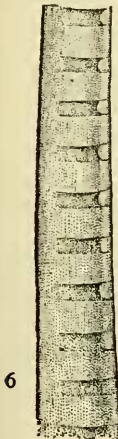
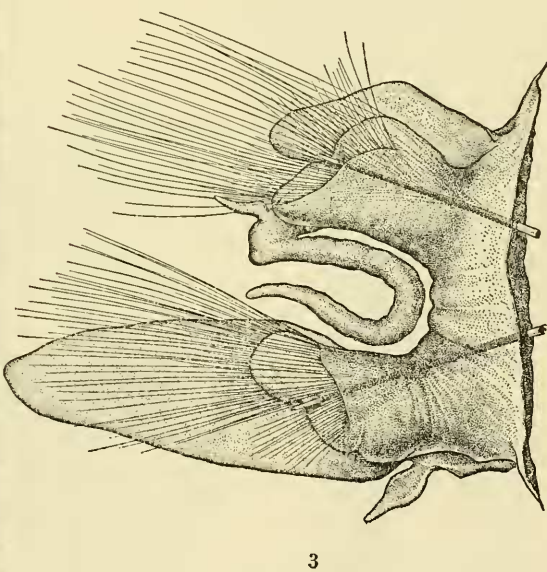
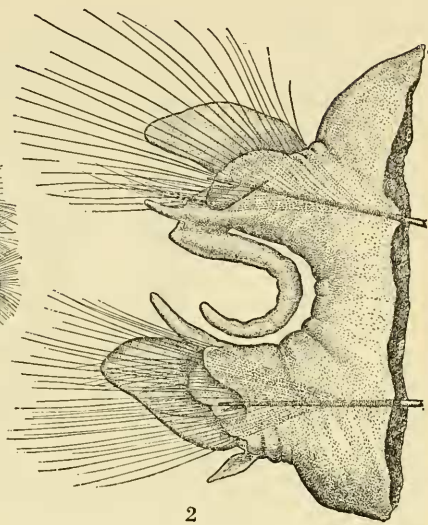
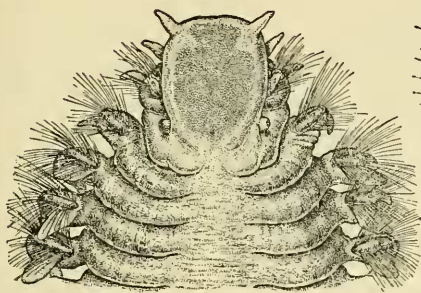


PLATE 16

Figures 1 to 6, *Nephtys acrochaeta*: Fig. 1, thirty-sixth parapodium in anterior view, x 23; Fig. 2, thirty-sixth parapodium in posterior view, x 23; Fig. 3, part of a preacicular barred seta near the basal end of barred region, seen from the front, x 608; Fig. 4, part of a preacicular barred seta seen from the side, x 608; Fig. 5, part of a postacicular seta showing spur and basal region of the spinous region, seen from the front, x 483; Fig. 6, part of a postacicular seta showing spur and basal region of the spinous region, seen from the side, x 483.

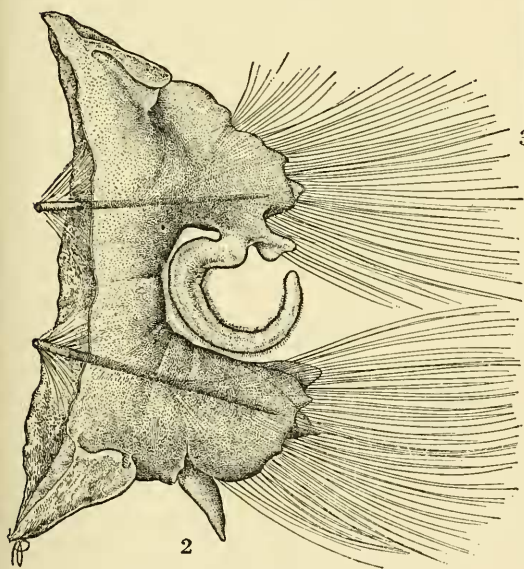
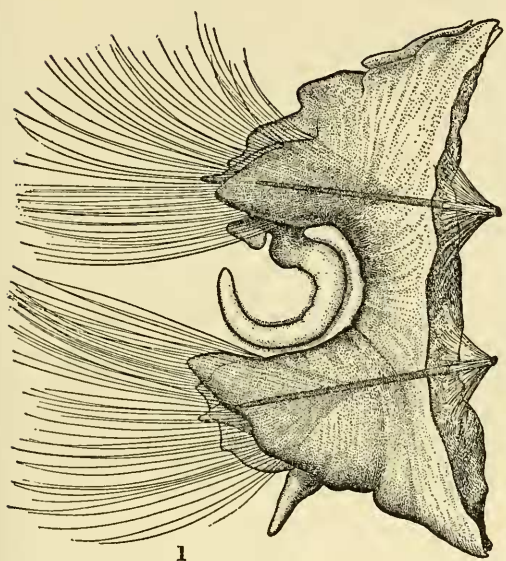


PLATE 17

Figure 1, *Nephtys monroi*: a neuropodial lobe from a median parapodium, setae and ventral cirrus omitted, x 35.

Figure 2, *Nephtys hombergi* (from type of *N. macandrewi* Baird): thirty-fifth parapodium in anterior view, setae omitted, x 14.

Figures 3, 4, *Nephtys impressa*: Fig. 3, twenty-first parapodium in anterior view, x 16; Fig. 4, seventieth parapodium in anterior view, ventral cirrus and setae omitted, x 16.

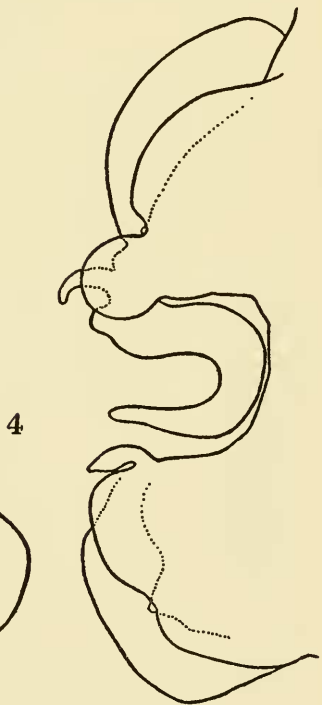
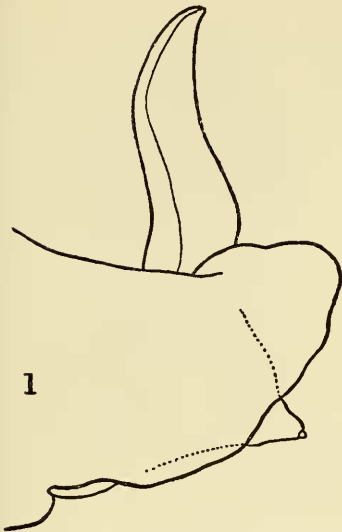


PLATE 18

Figures 1 to 8, *Aglaophamus dicirris* (436-36): Fig. 1, everted proboscis in dorsal view, x 28; Fig. 2, anterior end including prostomium and 6 segments in dorsal view, x 40; Fig. 3, twenty-eighth parapodium in anterior view, x 112; Fig. 4, furcate seta from twenty-eighth parapodium in full view, x 1340; Fig. 5, part of a middle postacicular seta near base of spinous region, in frontal view, x 2852; Fig. 6, part of a preacicular barred seta, from broadest region, in frontal view, x 2840; Fig. 7, part of a barred seta in lateral view, x 2840; Fig. 8, cross section of a barred seta at region shown in fig. 6, x 2840.

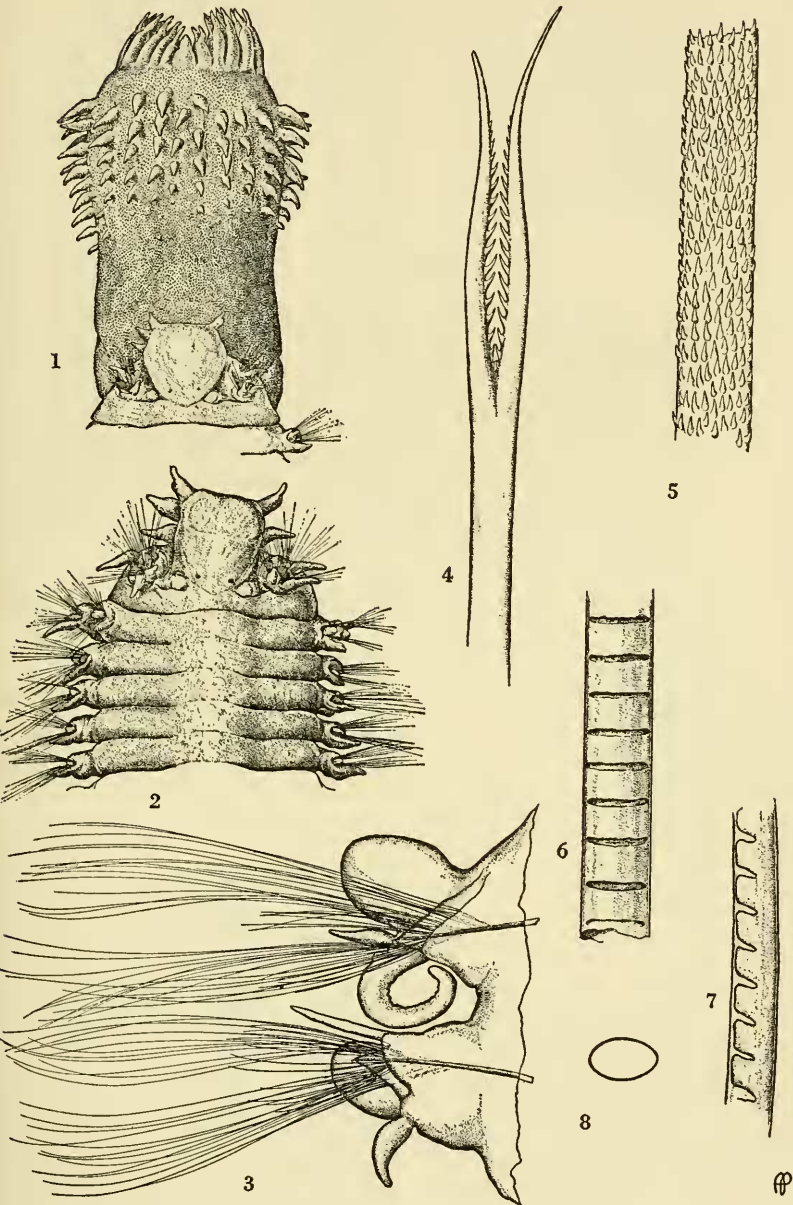
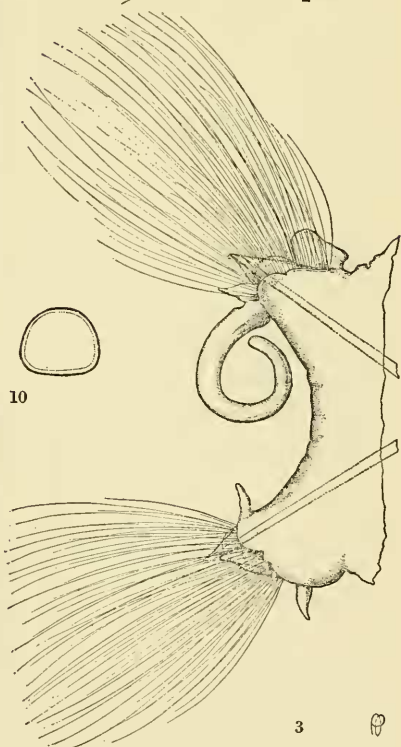
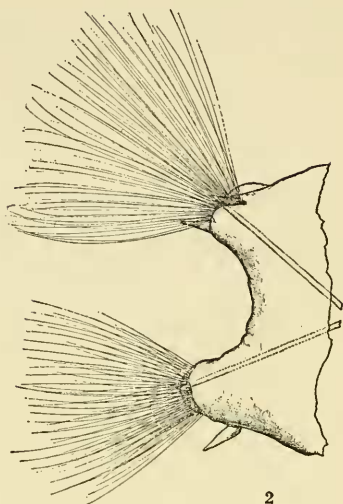
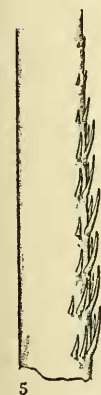
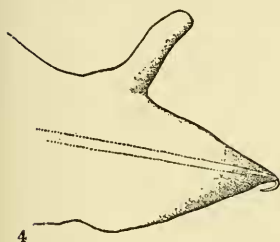
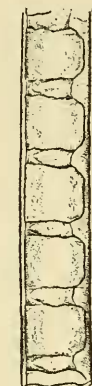
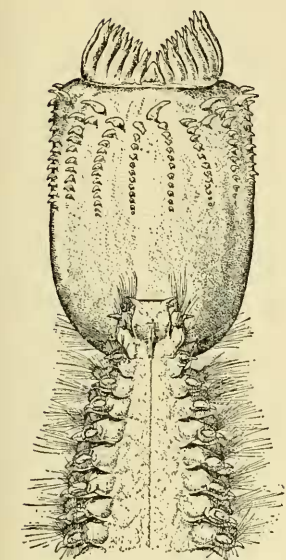


PLATE 19

Figures 1 to 10, *Aglaophamus erectans* (1316-41 and 1313-41): Fig. 1, anterior end in dorsal view (1316-41) and everted proboscis (1313-41), x 26; Fig. 2, eighth parapodium in anterior view, x 86; Fig. 3, twenty-seventh parapodium in anterior view, x 86; Fig. 4, thirty-fourth parapodium showing recurved aciculum and digitate lobe, x 180; Fig. 5, distal part of a notoseta from twenty-seventh parapodium in lateral view, x 3300; Fig. 6, part of a postacicular spinous seta, with maximum development of spines, in lateral view, x 3300; Fig. 7, part of a preacicular barred seta near base, in frontal view, x 3300; Fig. 8, part of a barred seta nearer the tip, in frontal view, x 3300; Fig. 9, part of a barred seta in lateral view, x 3300; Fig. 10, cross section of a barred seta, x 3300.



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